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Practice of Coal Mining in Great Britain

Under Certain Conditions, Longwall Mining Has So Many Advantages That Its Greater Adoption in America Is Only a Matter of Time

BY FLOYD W. PARSONS

The most unusual sight that greets the American engineer on his first visit to British coal mines, is the spectacle of women and girls working at the mines. Not long ago, female labor was employed underground; this practice, however, was abolished in Great Britain by an act of Parliament. My first impulse was to criticize the present custom of employing female labor in the screening plants and around the tipple, but closer investigation of this problem showed that these colliery lasses were better off than girls who worked in the mills. The wages paid these girls vary from 36 to 72c. per day.

That the character of the work done by these women does not seem to shorten their lives is shown by Fig. 2. The person shown in this photograph is the oldest woman employed on the pit brow of any of the mines in Lancashire. When the photograph was taken, she was 72 years old; her present age is 92, and she still works on the surface as a ganger. This woman worked underground as a miner, previous to the act of Parliament forbidding such practice. The young woman shown in Fig. 3 appears in the regulation costume that has lately been adopted. This dress differs from the one formerly worn, in that the skirt is longer and the trousers are not so much in evidence. Hob-nailed shoes shaped like miniature canal boats are still worn by all of these colliery girls, as well as the mill girls in Lancashire. In the early morning when the laboring classes are on their way to work, these wooden-bottomed shoes make a merry clatter on the stone street. Figs. 4 and 5 show colliery lasses in more ancient costume, with trousers and hob-nailed shoes.

The cheapness of labor in England is the one great drawback to the adoption of mechanical devices for coal picking, etc. In America, the coal operator would find it impracticable to employ so many persons to pick out the slate and bone, and in this way prepare the coal for market. Making a definite comparison of conditions abroad and conditions at home, I may state that at a bituminous mine near Punxsutawney, Penn., 30 men are employed in the tipple house picking slate from the coal; the cost of cleaning the coal this way by hand totals $52.50 per day, or more than 5c. per ton of output. This added cost of production is worrying the mine officials more than they are willing to admit, and if the seam retains its present dirty streak, some cheaper method of cleaning the coal will have to be adopted, or operating profits will be

FIG. 1. VIEW SHOWING INTERIOR OF A SCREENING HOUSE AT AN ENGLISH COLLIERY WHERE GIRLS ARE EMPLOYED TO PICK OUT THE SLATE. ALL BELTS AND MACHINERY ARE ELECTRICALLY DRIVEN

badly curtailed. In England, or on the Continent, the cost of cleaning this same output of coal would not total more than $15 per day, or less than one-third the cost of the same work in this country. The general method of cleaning the coal

FIG. 2. OLDEST WOMAN WORKING ON THE PIT BROW. PRESENT AGE 92 YEARS

FIG. 3. A LANCASHIRE COLLIERY LASS IN REGULATION COSTUME

at an English colliery is shown in Fig. 1. The wire-belt conveyers are all electrically driven, and as the coal is carried along, girls are employed to pick out the slate and bone. At the plant shown in Fig. 1, 20 girls are employed at a total cost of about $10 per day.

The Coal Seams Are Cleaner in America

If the coal seams in America were as dirty, and contained as many partings as is generally the case in European mines, our operators would be up against the proposition of either changing their methods and conditions or of seriously curtailing profits. I realize, of course, that we cannot compare mining in Europe with mining in America because the selling price of coal abroad is from three to five times as much as it is in this country. However, notwithstanding all this, the European operator has the better system, and if labor conditions and other influencing factors were the same as ours, the foreign operator would excel.

Longwall Should Be More Generally Adopted

Coal operators in America have practically set up one standard or system, by which they expect to operate all mines, irrespective of the character of the roof and bottom, thickness of the seam, and all other physical characteristics. There are many coal mines in the United States working seams from 3 to 6 ft. thick, on the room-and-pillar system, when every local condition suggests that a system of longwall would be most satisfactory and efficient for the development of the property.

FIG. 4. COLLIERY GIRLS EMPLOYED TO PICK SLATE IN SCREENING HOUSE

FIG. 5. ROBUST SPECIMEN OF FEMALE LABOR EMPLOYED ON PIT BROW

In various States (Illinois, for instance), the longwall system of mining is attempted at a number of places. The plan of mining, however, is not longwall in the true sense, and as shooting from the solid is universally practised at these mines, the benefits from the system are largely destroyed.

A few years ago it was generally believed that the longwall system of mining could only be applied to thin, hard coal seams, lying horizontal, with good roof and floor, and free from water. More recent practice in European mines has removed these narrow limitations, and longwall mining is successfully used in thicker seams where local conditions would formerly have barred this method entirely.

The style of longwall that should be adopted in any special case depends entirely on local conditions. A careful consideration of many factors is essential to a successful outcome. One important factor in determining the direction of the roads is the jointing or cleavage of the coal. There is always one direction along which the coal yields more easily than in any other, and the best plan is to drive the roads at right angles to this line of main cleavage. In very soft seams it is sometimes best to work the roads parallel to the main cleavage. When the joints in the roof coincide with the cleats in the coal, it is dangerous to drive the walls parallel to these cleats, for when this plan is followed, the roof becomes dangerous and bad falls are likely to occur.

The Length of a Longwall Face

The length of wall in a longwall working depends principally on the thickness of the seam, and the amount of material that is available for gobbing packs. The average length of wall in English mines varies from about 40 to 75 ft. in length. In some mines where the seams are above

4 ft. in thickness, the walls are driven from 100 to 200 ft. in length. The great disadvantage in having the walls too long lies in the fact that the coal is injured by breakage in the process of handling it two or three times along the wall before it reaches the gate road.

In working longwall, the mistake should not be made of having the roads too narrow; much trouble often results from this practice, owing to the packs getting squeezed out and catching on the cars. The size of pack depends largely on the amount of refuse obtained in working the seam. Under no circumstances, however, should a pack be less than 6 ft. along the face. In dirty seams where plenty of refuse is available for gobbing, the whole of the space from which the coal has been extracted may be completely packed.

The problem of timbering a longwall face deserves the most careful consideration. Although the working places should be carefully propped, no more timber should be left in the waste than can be avoided, as it keeps the roof from subsiding properly, and also increases the cost. One of the chief advantages of the longwall system is the large percentage of lump coal that is obtained through this method of development. In order to take full advantage of this factor, it is necessary to carefully sprag the coal face, so as to derive full benefit of the "weight" when it comes on the coal. At some mines where the roof is weak, the top is supported by old rails that are put up between the coal and the nearest row of props, the inner end of the rails being wedged into the coal.

Working a 16-in. Seam

At one mine in England the longwall system is being successfully used to develop a 16-in. seam. The roof overlying the coal at this mine is strong and composed of hard rock; the bed lies flat and but little water is present. This is one of the thinnest seams that is being successfully worked. It is doubtful if any method other than the longwall would produce satisfactory results here. Even in this instance it is probable that success is due to the fact that the roof is very strong and consequently little timber is required.

In America one of the principal arguments against the adoption of the longwall system, is that the coal seams are generally clean, and that but little refuse is available for gobbing purposes. In Europe, even this condition would not be considered a valid excuse for the adoption of the room-and-pillar system. In continental mines, when such conditions exist, the goaf is packed with sand or fine débris run in with water through a series of bore holes from the surface. The refuse and sludge from the coal-washing plants are sluiced with water into the waste workings. In such cases the water, after depositing its load, filters away through a dam placed at the bottom end of the pack, eventually reaching clearing tanks, from which it is pumped to the surface. The cost at various collieries for packing the waste in this way averages about 10c. per ton of coal produced; this cost includes all labor charges connected with the system of flushing, and also includes the cost of pumping, pipes, interest on capital, etc.

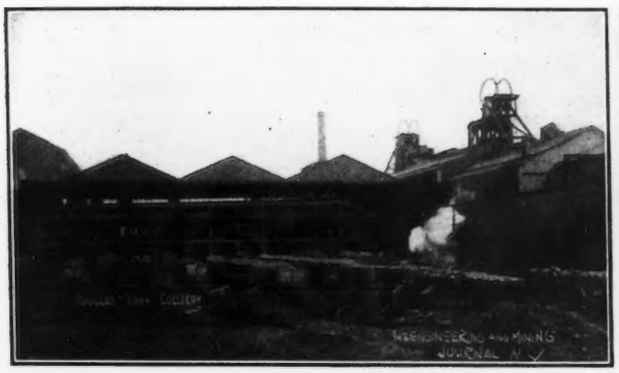


FIG. 6. SHOWING SCREENING HOUSE AND RAILROAD SIDINGS AT A MODERN ENGLISH COLLIERY

FIG. 7. INTERIOR OF SCREENING HOUSE SHOWING ROTARY TIPPLE WHICH IS WORKED BY A FRICTION WHEEL

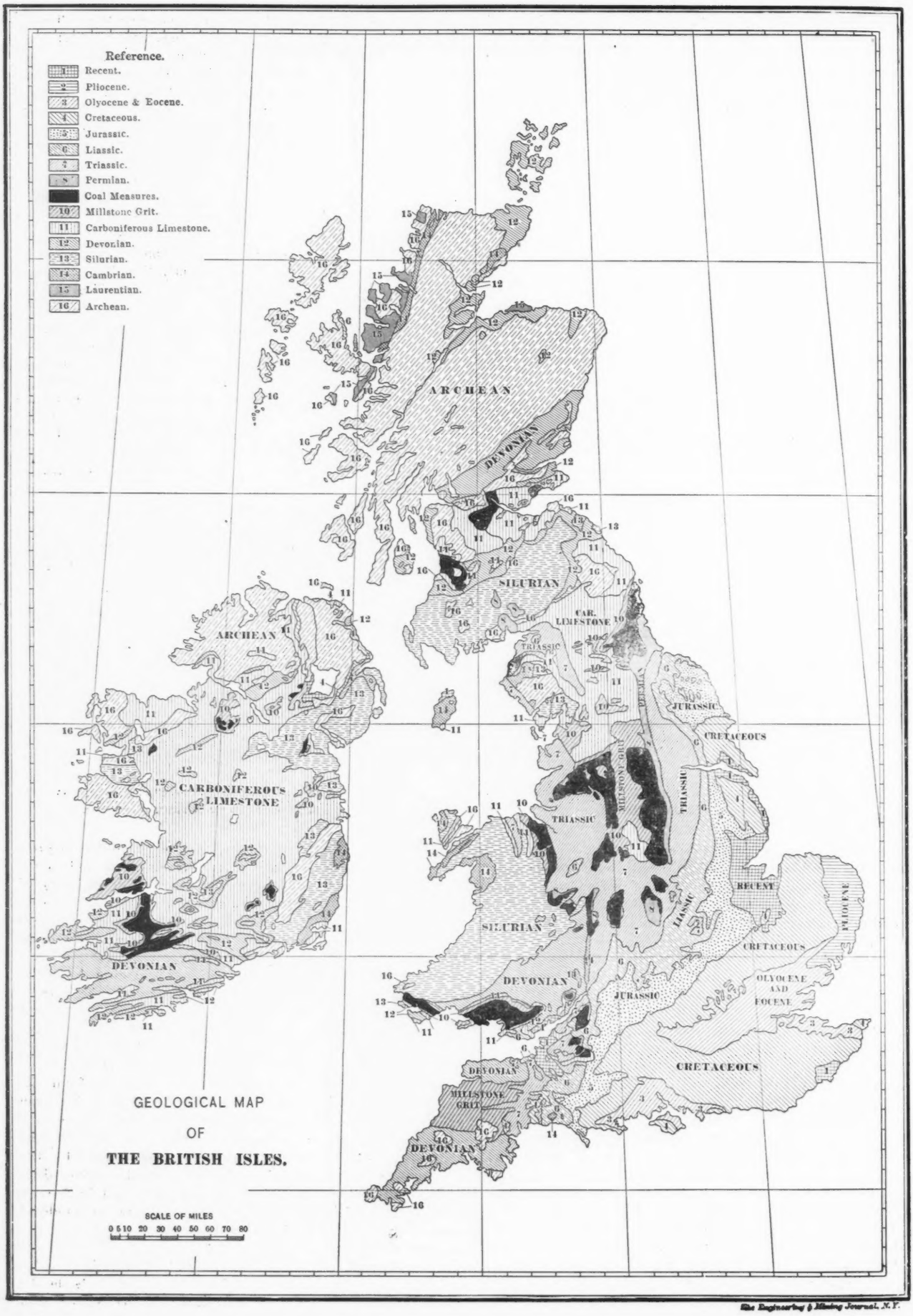
Advantages of Longwall

If it is expected to work the longwall system successfully, the line of face should be kept even so that the walls will not get closed, thus hindering ventilation and causing extra trouble and expense to open out the face again. It is also necessary to keep the walls going regularly. If proper precautions are thus taken, the longwall system will insure from 90 to 95 per cent. extraction. In addition to this the coal is easier to work longwall, as the constant weight of the roof is a considerable aid in mining; the working cost per ton is, therefore, cheaper than in room-and-pillar. Another point favoring longwall is that from 5 to 15 per cent. more lump coal is produced by this system. Furthermore, longwall permits the employment of more men in a given area, and consequently a larger output can be obtained. Two other points worth considering in this connection are the ease in ventilating longwall workings and the comparatively short hauls for a given output.

In concluding this argument for the greater adoption of longwall in American mines, I do not wish to be understood as advocating this system for all coal seams under every condition. There is no question but that in many of our thick seams where the roof is bad, and where but little refuse is present in the seam, the room-and-pillar method of development is best adapted. I do claim, however, that many of our mines could be worked longwall more efficiently than by the present room-and-pillar practice. Also that at several mines in this country where longwall has been tried and abandoned, the failure of the system was due largely to ignorance on the part of those in charge of the operation. The time will soon be here when American coal operators will find it as much to their advantage to extract the maximum percentage of their coal acreage, and to produce their output in the best possible condition with regard to size, as it is to produce a great tonnage in a minimum time and in the worst possible shape. The majority of American mines are now producing only from 45 to 65 per cent. lump (the average percentage lump production in this country is about 55 per cent. of the total output). This estimate I base on the use of a standard 1¼-in. screen. The average percentage of lump production in England and on the Continent, estimated on a similar basis, is from 60 to 80 per cent. With the adoption of coal-cutting machines, and the abolishment of shooting from the solid, it is to be hoped that American operators will soon be producing as good a grade of coal, with respect to size and soundness, as is produced abroad. The adoption of the longwall system where conditions are favorable, will further increase the improvement in the grade of coal produced.

The Park Collieries

Many engineers prefer to study the details of individual practice rather than



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read a general description of the methods that prevail in one entire field. The Park collieries located at Garswood, England, are representative of the medium sized mines in their district.

At this property, the roads at the foot of the shaft are supported with 2-ft. brick walls which carry steel girders to hold up the roof. These walls extend 540 ft. from the shaft bottom. In all of the main roadways, arched timbering is used to support the roof. Near the foot of the shaft, and built carefully in the coal seam just off the main roadway, is the mine stable. This room is built with substantial brick walls, and is frequently whitewashed. The gutters in the stable are laid on a proper slope, so that drainage is good. Ventilation is secured by means of two regulators each 1 ft. square. Both of these regulators are located at the end of the stable nearest the intake airway, and one is located near the center of this end so that when the stable is being cleaned, this regulator is opened and all dust and dirt are quickly swept away. The other regulator is the one properly used for ventilation, and is situated at the same end of the stable, but near the side of the end, so that when this regulator is opened, the air passes through the stable at the head of each stall, thus giving the ponies plenty of fresh air directly over their mangers. One extra animal is kept underground, so that every fifth day one pony can rest.

The Men Are Checked In and Out

The men working underground at the Park collieries are carefully checked in and out of the mine each day. Near the bottom of the shaft and on the main roadway are two big check-boards. When the miner descends the shaft, he goes immediately to the lamp room where one man takes his check, delivers him his lamp, and another man records his name; the miner passes on into the mine and the check is hung up on the board. When the miner returns from the face, preparatory to leaving the mine, he takes the check, with his regular number on it, to the lamp room where his return is properly recorded. This system of checking makes is easy for the management to know just which men have been caught underground in case of an accident.

In descending the shaft at the Park mine, the first seam encountered is known as the Wigan, which is a 4-ft. bed lying 63 ft. below the surface. About 18 ft. below this seam is another bed known as the Wigan 9-ft seam. Descending further, the Orrell 5-ft. bed is encountered at a depth of 765 ft., and at a depth of 960 ft. from the surface is the Arley seam, which bed is only about 3 ft. thick. A permitted explosive known as ammonite is used to blast out the coal in the upper seams. In the Arley seam, no powder is used at all, the coal being brought down by the hydraulic mining cartridge. In the seams using explosives, the cost of the powder per ton of coal, over a period of two years, was approximately 4.1c. All of the seams are worked longwall, and everything is undercut, no coal being shot from the solid. A careful record of operations in the Arley seam during the past year shows that 7 per cent. more lump coal was produced by the hydraulic cartridge than was formerly mined with explosives. One other point advanced by the managers of this colliery is that the coal brought down without explosives is better able to stand knocking about and loading. Investigation also showed that during the past year, each cartridge produced 3 tons of coal per thrust.

The underground haulage at the Park collieries is accomplished by endless cable; when it is necessary to extend the haulage system, the cable is spliced. The coal is undercut with the Pickwick electric undercutters.

As is the case at practically all European collieries, safety lamps are used underground exclusively. The dust on the return airway is moistened and rendered harmless by sprinkling with calcium chloride. The superintendent said that this method of dampening the dust has proved safer and eventually cheaper than sprinkling with water.

Double-deck cages covered with substantial sheet-iron hoods are used at this mine and are of the type generally adopted throughout England. Girls are employed to do most of the work about the screening house, and tipples on the surface. These colliery girls are paid from 36 to 72c. per day.

Accompanying this article, I am showing a geological map of the British Isles. This map is practically complete in itself and will prove an interesting study if the numbered reference or legend at the top of the page is consulted. It will be noticed from a study of the map that the coal measures in England rest on the Millstone Grit, which series in the reference is numbered 10. In Lancashire where the Park collieries are located, the Millstone Grit is 5000 ft. thick. In South Wales this series is only from 400 to 1000 ft. thick.

The degree of concentration with which coal mining in Great Britain is carried on is made plain to us when we note that the coalfields of England cover an area of 2821 square miles, and those of Scotland 1547 square miles, making the small total of only 4368 square miles as the available area containing workable coals. From this area the British last year produced 261,500,000 tons of coal. The experts in England estimate that at the present rate of production, the coal of the country will still last about 475 years. It is interesting to compare this with figures relative to our own country. The total area of our coalfields is given as 496,776 square miles, or from an area more than 100 times as great we produce less than twice as much coal. It is also worthy of mention that our experts calculate the exhaustion of our easily available coal as less than 100 years in the future. With our wasteful methods, an occasional good scare is not to be deplored; however, if we base the future on the past the outlook is full of hope, for at home and abroad every new estimate of available fuel supplies has shown an increased total on hand. Old Mother Earth is remarkable in her way, for the more she spends and gives away, the more she seems to have left.

Copper-Clad Steel*

By Wirt Tassin

For many years past attempts have been made to cover steel with a copper coat which could be of any desired thickness, and to so firmly weld the two metals that the combined product could be submitted to any of the usual methods for working metals without destroying the integrity of this weld.

The many methods tried in the past have been more or less successful failures, either from a metallurgical or a commercial standpoint, and it is only recently that a process has been developed for the successful welding of copper to steel in such a manner that it will stand the many methods used for working metals, and be at the same time a commercial metallurgical product.

The weld between the copper and the steel is perfect within the limitations of a metallurgical process. The copper can be separated from the steel only by melting it off. The weld will resist sudden temperature changes such as heating the combined metals red hot and then quenching them in ice water. It will resist both stress and shock.

Details of the Process

The process by which this result is obtained may be described as follows: Steel of any desired composition and shape, which, for the purpose of this description, will be regarded as being a mild basic open-hearth steel, rolled into rounds and cut into 26-in. billets to make wire rods, is sandblasted and pickled to remove scale. The billet, which has previously been drilled and tapped at each end, is hung by means of a rod and bushing screwed into one end, in a pre-heater, and is brought to a red heat. When the desired temperature has been reached, the billet is then drawn into a tube (also previously heated) by means of a rod which is screwed into the top of the bushing. This rod slides up and down in the center hole of a three-jawed chuck, which holds the tube and centers the billet in it. A steel flange is then screwed on the bottom of the billet, thus forming with the tube a mold in which the billet is the core.

*Reprint from *Journ. Ind. and Eng. Chem.*, Sept., 1909.

The mold and billet are now carried to a pot of specially prepared copper which is in a super-molten condition. The billet with its attached flange is now lowered out of the tube and into this copper, and kept there for a length of time sufficient to wet the surface of the steel and to form an alloy film. The billet is then drawn from the copper up into the tube, and the billet and its mold are carried to a second pot containing commercially pure copper, in which the final coat of copper is applied. The mold with its billet as a core is lowered into this pot and the molten copper rushes in through two openings in the top of the tube until the mold is filled. The mold is then withdrawn from the second crucible, and when the copper has frozen, the chuck, rod and flange are unscrewed. The tube and its contents are next placed in a ram and the copper-clad steel billet is pushed out of its mold. The billet is now given a washing heat and is then rolled to the desired size.

The rolling is, in general, similar to that of steel or copper, and it is interesting to note that in spite of the great differences between the physical properties of copper and steel, the two metals when so welded have, under proper conditions, practically the same rate of flow. The proportional areas of the copper and the steel remains practically a constant from the larger to the smaller sizes.

Unusual Tensile Strength

The tensile strength of the copper-clad steel is also remarkable. Regarding the metal as having 40 per cent. of its sectional area made up of copper, its tensile strength after the proper treatment is equal to, and may be greater than that of a steel having a composition similar to that of the steel in the copper-clad, but whose sectional area is equal to that of the clad metal. An illustration of this may be seen in the accompanying table of commercial wires, in which due allowance must be made for the difference between hard and soft drawing:

STRENGTH OF VARIOUS WIRES.

Name.	Diameter in Inches.	Breaking Weight in Lb.
Galvanized steel	0.162	1406
B. B.	0.162	1250
E. B. B.	0.162	1140
Copper	0.162	1237
Copper-clad	0.162	1874

This table is an illustration of the fact that the tensile strength of the copper-clad steel is not the mean of the strength of copper and steel, for the composition of the steel in the galvanized wire quoted is practically that of the steel in copper-clad, and, making liberal allowance for the difference in the heat treatment of the two, the breaking weight of the copper-clad is equal to, if not greater than, that of the galvanized, and but six-tenths of it is steel.

The above statement is also true of its elastic limit, which will average 90 per cent. of its tensile strength. The elastic limit of copper under the best conditions is 60 per cent. of its ultimate strength. That of steel is a variable, but for comparison take it at 90 per cent. Copper-clad steel, four-tenths of whose sectional area is a metal having a relatively low elastic limit, gives a figure directly comparable with that of a steel treated under like conditions whose sectional area is equal to that of copper-clad, and whose composition is similar to that of the steel composing its core.

Galvanic Action

Copper and steel in the presence of moisture form a galvanic couple, and the corrosion of the steel proceeds with great rapidity. The resistance to corrosion of copper-clad steel, so far as the copper coating is concerned, is, of course, the same as that of copper. But, in view of the marked galvanic action set up between copper and steel, it would be assumed that corrosion would quickly occur at the exposed ends, and be a constant factor so long as an electrolyte was present. This supposition is not so, at least in the presence of fresh or salt water. Test samples placed in water, through which a current of air has been allowed to bubble continuously for three months, demonstrated that after a certain period of time, somewhere between 15 and 40 days, corrosion practically ceases, as shown by taking the loss in weight of the tests at varying periods. It is believed that this stopping of corrosion is a result of the following conditions:

After a certain amount of rust has been formed, it appears that a thin film of copper mixed with some copper oxide is plated out or deposited between the iron oxide and the unattacked steel, and that this film will act as a preservative coat as long as it remains intact. If broken, further oxidation is set up and the process simply repeats itself. While it is true that the corrosion on the end of a wire is not a factor in its life, yet the corrosion of the end of a relatively large diameter may become serious. If the above observations hold true on larger sizes (so far it has not been tried on sizes above ⅜ in.), it will have quite a bearing on material suitable for marine work. Tests along this line are now being carried out, and the evidence to date points to a confirmation of the observations made on the smaller sizes.

Possible Uses

The uses to which copper-clad steel may be put are many. The first and most obvious is a wire to be used for electrical and mechanical purposes. The conductivity requirements for electrical use depend directly upon the amount and kind of copper used in the coat. Thus a copper-clad wire, four-tenths of whose sectional area is copper, will have a conductivity of 40, since both copper and steel wire possess certain disadvantages for electrical work, the one having a low tensile strength and under given conditions a lack of toughness, the other having a low conductivity and being subject to a more or less rapid corrosion.

Copper-clad wire has a strength and toughness equal to that of steel, a conductivity far greater than that of steel, and it will not corrode. For example, in telephone work the life of a line is dependent upon its breaking weight and elastic limit. The breaking weight and elastic limit of a No. 10 copper wire are respectively 530 and 293 lb., while that of a No. 14 copper-clad is 760 and 320 lb. The one weighs 166 lb. per mile and the other 61. Comparing copper-clad with galvanized-iron telephone wire, a much smaller size of copper-clad may be used for the same ohmic resistance.

RESISTANCE OF GALVANIZED AND COPPER-CLAD WIRE.

Wire.	Diam., In.	Ohms per Mile.	Weight per Mile, Lb.
E. B. B	0.134	18.83	250
B. B.	0.134	22.04	250
Copper-clad	0.134	7.50	266

Where a high tensile strength and resistance to corrosion is an essential and an increased conductivity is desirable, as for example in power transmission requiring long spans and in catenaries, its value is apparent.

For mechanical purposes, such as bridge work, derrick guys, rigging, springs, rounds of all sizes suitable for anchor bolts, pump rods, etc., where resistance to corrosion combined with a high tensile strength is an essential, copper-clad steel is admirably adapted since steel having any desired physical qualities may be used as the core. For large structural shapes it is questionable whether this material will ever have a commercial use, but for light shapes suitable for skylight and similar work, its value is obvious. It is non-corrodible and possesses the strength of steel. Copper is weak, and galvanized iron corrodes.

To sum up, the material has a greater strength than copper and under given conditions equal, if not greater, strength than steel. It has a greater conductivity than steel and less than that of copper. Its resistance to corrosion is equal to that of copper and immeasurably greater than that of steel.

According to the U. S. Geological Survey the production of tourmaline in 1908 was 3300 lb., with an estimated value of $90,000. In 1907 the production was 2140 lb., valued at $84,120. The bulk of the 1908 production came from California; at Mesa Grande a perfect tourmaline weighing 55 carats after cutting was obtained.

Modern Type of the Barrel Copper Converter

Now in Use at a Number of Copper Smelteries. Suggested Improvements for Increasing Lining Efficiency with Consequent Cost Reductions

BY CHARLES F. SHELBY*

Figs. 1, 2, 3, 4, 5 and 6 in the accompanying illustrations show the general design of the modern type of " barrel converter" that is giving such good satisfaction at quite a number of copper smelteries throughout the United States and other countries. Figs. 7, 8, 9, 10, 11 and 12 illustrate an important modification of the same, which without materially increasing the cost of manufacture, might increase the lining efficiency, or tonnage per shell, as high as 250 per cent.; i.e., that for each time the converter was lined it could turn out 2½ times as much copper from the same grade of matte and with the same character of linings.

The converter shell first considered has for standard dimensions: Diameter of cylinder, 8 ft.; length of cylinder at center, 11 ft. It is equipped with cast-steel heads on which are cast the riding rings as an integral part of the same. These are turned true and are spaced 8 ft. 9⅛ in. centers. The improved design is spherical in shape, and in this instance is so proportioned as to be interchangeable on the same stand with the "barrel shape." This new type is formed on the lines of a sphere 11 ft. in diameter. It is also provided with cast-steel heads on which are also cast integral riding rings, spaced to coincide with those of the cylindrical-shaped shell.

Difference in Capacity

The point at issue between the two shapes consists in the cubical contents of useful lining capacity. By referring to Fig. 6, which is a horizontal section through the center of the cylindrical type, showing the metallic shell, the refractory brick lining used as a protector for the metal, and the regular silicious lining, we notice inscribed within the brick lining the outlines of an ellipse of which the extremities of the major and minor axes extend to the brick lining.

This ellipse represents about the lines of maximum utility of the silicious lining in a converter of this shape; and ignoring the nose of the converter, a calculation in which the cubical contents of an ellipsoid, having axes equal to this ellipse, is determined, will result in the cubical contents of maximum available lining for slag-forming purposes, but from which result the contents of the "form" or "drum" used in lining the converter must be deducted.

The natural tendency of an operating converter in consuming lining is to make a round hole of the rectangular one originally provided as a matte receptacle. This results in the linings being worn away near the center tuyeres first, while the balance of the shell is still provided with an abundance of useful material for slag-forming purposes, were it not for the condition of the center tuyeres necessitating relinings.

It is impossible, in a converter of this type, to utilize all the linings tamped in, except by prolonged "blowing on the bricks," which would mean a short life for the metallic body itself. Even the line shown is generally better than can be obtained in practice.

Fig. 12 shows the same section through the ball type of converter, in which the natural tendency of the lining to wear off or the space to enlarge, is in conformity with the shape of the shell, the result being that the maximum lining efficiency of this shell is 100 per cent. of that contained within the sphere proper.

Of course, this also cannot be maintained in practice, but the factor of error is probably proportional to the ellipsoid considered in the barrel type, and comparisons will be made then on the basis of maximum efficiency in both cases.

Capacity of Barrel Type

We find that the barrel type of converter has a cubical capacity inside of the brick lining of approximately 365 cu.ft., and that the form used in lining this converter has a cubical capacity of 70 cu.ft. This leaves net for silicious lining 295 cu.ft. We find that the ellipsoid considered has a cubical capacity of 242 cu.ft. Deducting therefrom the form again, 70 cu.ft., we have for maximum available linings 172 cu.ft., or 58.3 per cent. of the total lining capacity figure; the remaining 41.7 per cent. being inert material, a large portion of which, when originally put in the converter, remains there until the shell is worn out or it has to be dug out for new bricks or repairs.

Capacity of Ball Type

With the ball type of converter we find the cubical capacity to approximate 564 cu.ft. We allow for a special form better adapted to this shape, 121 cu.ft.,

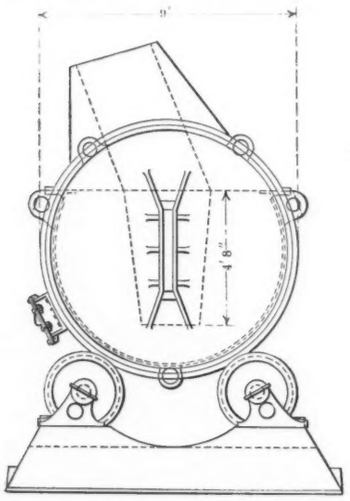


FIG. 1. SIDE VIEW WITH DRIVE CONNECTION, BARREL TYPE

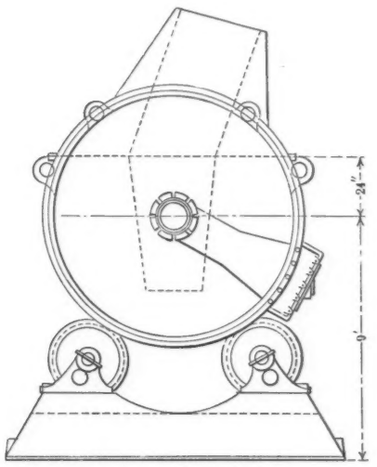


FIG. 2. SIDE VIEW WITH WIND CONNECTION, BARREL TYPE

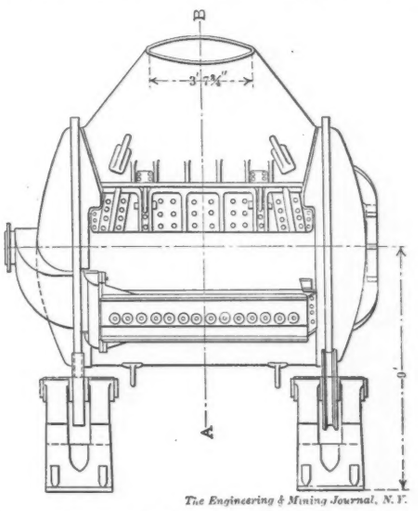


FIG. 3. FRONT VIEW, BARREL TYPE

*Superintendent, reduction division, Cananea Consolidated Copper Company, Cananea, Sonora, Mexico.

leaving a net lining capacity of 443 cu.ft., of which we consider 100 per cent. to be the maximum available figure.

These 443 cu.ft. compare with the 172 of the barrel type as 2½ to 1, indicating that a "ball" type of converter that will correspond in leading dimensions to the present popular "barrel" type would give a lining efficiency nearly 250 per cent. greater.

MINOR ADVANTAGE OF BALL TYPE

There are other minor advantages to be gained with the proposed shape other than an increased lining efficiency. A decreased amount of crane service is necessitated in changing shells. There is practically an entire elimination of the practice of digging out a converter after it has been taken off the stand in order that the form or drum may be put in again. This work will be done on the stand with the ball type by slagging the former surplus material. This will also result in a lack of the necessity of using so much water to cool off the shell so that men can get at it and dig it out; and this again means that the heat retained in the shell assists in the subsequent drying.

Larger charges, both initial and subsequent, can be blown in the proposed type by means of its greater cubical capacity. The weight of a barrel-type converter, lined, and of the size considered, is about 45 tons, whereas the spherical type of the size considered would approximate 63 to 65 tons.

I have had this type of shell in view for a number of years, but have never been so situated as to have the proper opportunity for a demonstration. At Cananea our cranes are not of sufficient strength to carry the increased weight of the loaded shell. Three years ago, when it was decided to remodel the converter plant, this type was strongly considered, but finally abandoned for the above mentioned and other reasons. I hope that someone may be able to use these designs and demonstrate the superiority of the proposed shape. They are not patented.

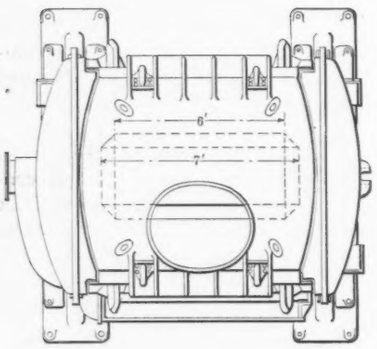


FIG. 4. TOP VIEW BARREL TYPE

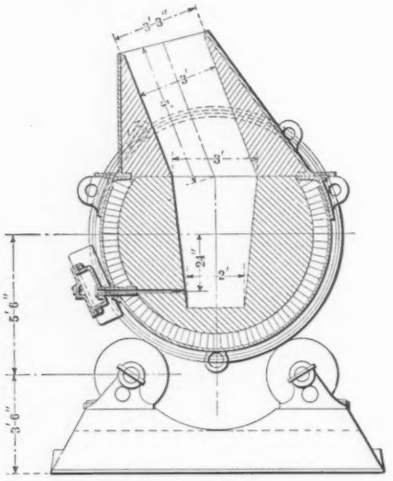


FIG. 5. SECTION A-B BARREL TYPE

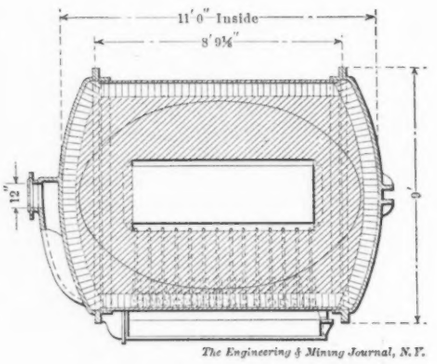


FIG. 6. SECTION C-D BARREL TYPE

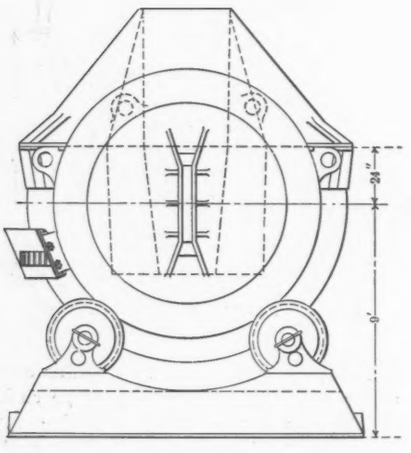


FIG. 7. SIDE VIEW WITH DRIVE CONNECTION BALL CONVERTER

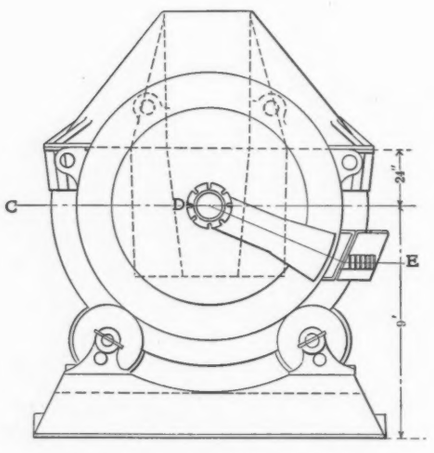


FIG. 8. SIDE VIEW WITH WIND CONNECTION BALL CONVERTER

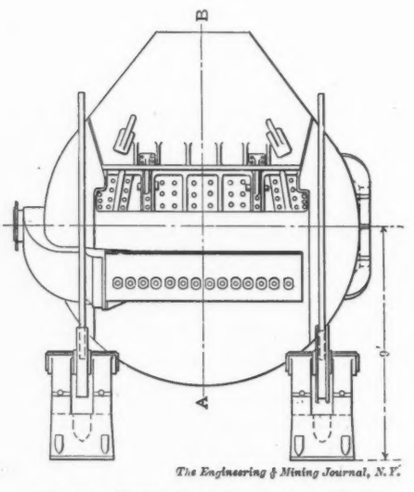


FIG. 9. FRONT VIEW BALL CONVERTER

Lehigh Valley Coal Company

This company owns and controls a large estate in the anthracite-coal region of Pennsylvania. It is controlled by the Lehigh Valley Railroad Company, and its mines are tributary to that road. The report for the year ended June 30, 1909, shows that its capital consists of $1,965,000 capital stock, $13,138,500 bonds, and $10,537,000 certificates of indebtedness, representing advances made by the railroad company.

The report does not give any statement of gross earnings or of coal sold. The income account shows net income for the year of $375,452; deductions for royalty settlements and other adjustments were $97,400, leaving a balance of $269,052. Adding $1,976,846 brought forward from previous year made a total balance of $2,272,898 at the close of the year.

The coal statement for two years is as follows, in long tons:

	1907-'08.	1908-'09.	Changes.
Anthracite mined	9,263,899	7,734,078	D. 1,529,821
Bituminous mined	276,154	288,457	I. 12,303
Breaker hours worked	46,891	36,893	D. 9,998
Per cent. domestic sizes made	60.49	62.94	I. 2.45
Per cent. steam sizes	39.51	37.06	D. 2.45

The decrease in anthracite mined was 16.5 per cent., but the decrease in breaker hours worked was 21.3 per cent. The bituminous coal was mined in the Snow Shoe region in central Pennsylvania, where the company owns coal lands and mines.

The report says, in substance: "The conditions surrounding the anthracite-coal industry during the year have been far from satisfactory. As a result of two unusually mild winters and the general curtailment of commercial activity, the demand for coal fell off considerably. This occasioned irregular working of the collieries, which necessarily increased the cost of mining. The drought in the coalfields during the summer and fall of 1908 made it exceedingly difficult and expensive to obtain the requisite amount of water to conduct some of the operations and enforced the suspension of mining at certain collieries at a time when they could have been worked most advantageously. Then, too, the uncertainty in the labor situation made it advisable to stock large quantities of coal in order to insure a steady supply to the public in the event of a general suspension of mining. This further increased the expense of operation during the year. The labor situation was finally adjusted by extending the award of the Anthracite Strike Commission for a period of three years from April 1, 1909, upon the same general terms and conditions.

"The expenditures during the year for additions and betterments amounted to $487,178, a decrease of $267,951 as compared with the previous year. It is only by the continuance of the company's policy of concentrating its breaker operations as much as possible, installing improved machinery for the purpose of reducing the labor cost and increasing the percentage of prepared sizes, centralizing power and pumping plants and constructing tunnels for natural drainage wherever opportunity affords, that the cost of mining can be kept within reasonable limits. The cost of producing coal is each year showing a serious increase, owing to the gradual exhaustion of the thicker and more cheaply mined veins near the surface, making it necessary to work thinner veins at greater depths and longer distances from the openings. This increases the cost of the underground operations and of pumping and ventilating, which latter are continuing items of expense, as great when the mines are idle as when in operation. The new breaker plant at Spring Mountain has been completed and is now in operation. The total cost was $374,160. In addition to the preparation of coal from new fields, this breaker is, with but little additional expense, handling the coal from Oneida and Spring Brook collieries, which has enabled the abandonment of the breakers at those two points with the attendant expense of operation. In furtherance of this policy of concentration, the old breaker at Hazleton Shaft colliery is being enlarged and rebuilt on a basis that will permit of preparing not only the tonnage of that colliery, but also of Stockton and Deringer, with practically no increase in the operating cost. The expenditures for this work were $102,451 during the year.

"Other improvements included a tunnel at Blackwood to provide water supply; concentrating the pumping plant and installing electric haulage at Packer No. 5; improved ventilating system; a new washery at Leviston to work the Beaver Meadow culm banks.

"Notwithstanding the restricted operations, mining was so conducted from those lands held under lease as to cause no increase in the advance royalty account, the same showing a slight reduction at the close of the year. Current assets are $4,948,150 in excess of current liabilities."

The Lehigh Valley railroad carried during the year 13,273,136 tons of coal and coke, the ton-miles being 2,017,613,649; an average haul of 152 miles. The total The total revenue from coal and coke was $14,831,671, being 44.8 per cent. of the total earnings of the road. The average rate per ton-mile was 0.735c. There was a decrease of 8.6 per cent. in coal carried, and of 8.3 per cent. in coal earnings, as compared with the previous year.

The Empire District Electric Power Company has been chartered to erect a plant two miles west of Galena, Kan., of 20,000 h.p., using steam. The power is to be used for commercial and mining purposes throughout the zinc and lead district. The company is successor to Henry L. Doherty Company, of New York, which recently absorbed the Spring River Power Company, already having plants of the combined capacity of 20,000 h.p. It is stated that this is the initial installation of a much larger project which has in view the development of ample power for all of the large tributary districts. The capacity of the Spring River company has been under contract from the outset, and there is an increasing demand for electrical power for the mining industry of this section.

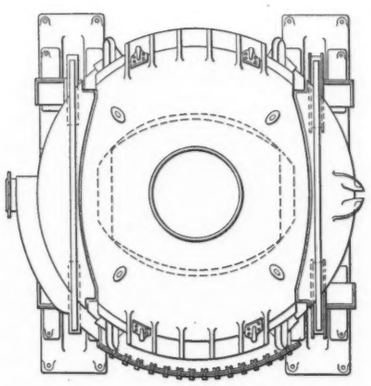


FIG. 10. TOP VIEW BALL CONVERTER

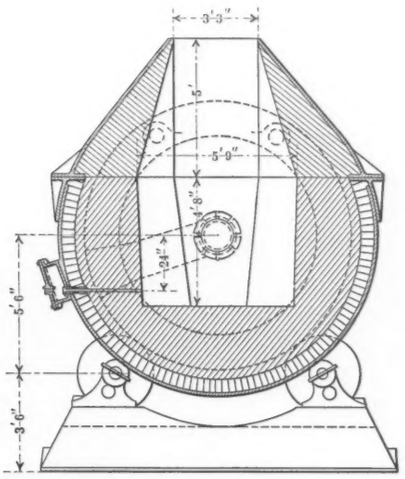


FIG. 11. SECTION A-B BALL CONVERTER

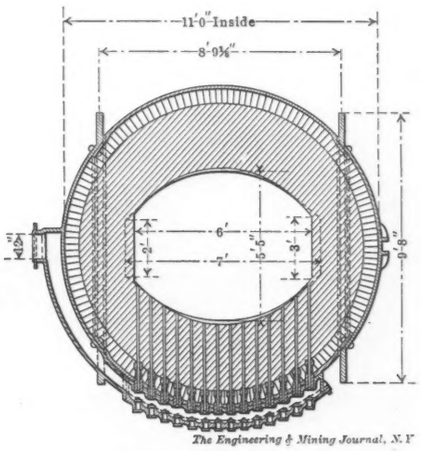


FIG. 12. SECTION C-D-E BALL CONVERTER

If all the protective coverings and casings in an underground electrical system are carefully earthed, the danger of shock is practically eliminated. It is also advisable, on the part of safety, to provide for a daily test of the operation of all automatically opened circuits.

During the year ended May 31, 1909, there were on an average 39.30 machine drills at work per day at the Alaska Treadwell. The average number of tons broken was 29.28, feet drilled 28.47 at a cost of $7.23 for labor and $2.85 for explosives, all per machine shift of 10 hours.

The Presidio Silver Mines, Shafter, Texas

Situated in Semi-arid Belt. Orebodies Occur in Cretaceous Limestone. Mill in Operation for 25 Years; 15 Miles of Underground Workings

BY MORRIS P. KIRK*

Texas is generally looked upon as a land of plains, cattle and cotton, but nevertheless southwestern Texas, beginning at El Paso and extending 300 miles in a southeasterly direction along the Rio Grande river and south of the Southern Pacific railroad is a highly mineralized country and contains several good producing mines and many promising prospects.

Situation and Climate

Of these the silver mines at Shafter, the property of the Presidio Mining Company, in the southern part of Presidio county, 15 miles from the Mexican border, are the most important. Shafter is reached from Marfa, a point on the Southern Pacific railroad, 200 miles east of El Paso and 430 miles west of San Antonio, from which place the stage leaves daily, covering the distance of 45 miles in seven hours. Upon the completion of the Kansas City, Mexico & Orient railway to Presidio, at which point it crosses the Rio Grande river and enters Mexico, the mines will be within 12 miles of the railroad.

In the immediate vicinity of Shafter the country is rugged and has been the scene of great volcanic activity, but beginning a few miles north of the camp and extending to the railroad it is characterized by rolling hills and plains.

While it is in the semi-arid belt, it has a delightful climate except for a few months in summer, and even then the nights are cool, the mine being situated at an elevation of 3850 ft. above sea level. The rainfall is light, but sufficient for stock-grazing purposes.

History of the Mine

The Presidio mine was discovered in 1881 by Mexicans in the employ of John Spencer, an old pioneer who resided near Presidio on the Rio Grande river. He interested William R. Shafter, of Santiago renown, then a young captain stationed at Fort Davis, a military post 65 miles north of Shafter. Mr. Shafter in turn secured the support of some California people, and operations were commenced in 1882, the mill being built the following year. This mill has been in continuous operation ever since, and has treated about 371,000 tons of ore, from which were recovered in the neighborhood of 9,761,000 oz. of silver.

The Presidio Property

The property consists of a rectangle one mile square upon which the mine is located. In addition to this the company owns 37 acres on Cibolo creek, 6000 ft. distant, where the mill and town are situated.

The orebodies occur in the same Cretaceous limestone in which are found the Sierra Mojada, Santa Eulalia, Sierra del Carmen and other great silver mines of northern Mexico. The mine was first worked as an opencut, but there are now five shafts on the property, ranging in depth from 200 to 700 ft.; one of these, the East shaft and the present main working shaft, is of two compartments, equipped with a double-drum hoist, is 700 ft. deep, and was sunk by Mexican labor by hand drilling in 11 months. The mine contains over 15 miles of underground workings. The levels are usually 100 ft. apart, and many of them are run in the soft porphyry of the dikes; they are well ventilated and perfectly dry and require no timber. The large stopes from 40 to 70 ft. square and 20 to 40 ft. high, containing no timber or any other support for the roof, are interesting sights.

EAST SHAFT OF THE PRESIDIO MINING COMPANY, SHAFTER, TEX.

Occurrence and Nature of the Ore

The ore occurs as a replacement deposit in limestone and where first discovered outcropped on the surface. It has been followed along the dip of the formation, which is 15 deg., and in a southeast course for a distance of 2500 ft., and to a depth of 600 ft. The orebodies are irregular, ranging from 40 to 550 ft. in breadth and from 6 to 40 ft. in thickness. The limestone is cut by several well defined faults and porphyry dikes and one of the former on the west marks the western extent of the orebody. The porphyry

*Mining engineer, Judge building, Salt Lake City, Utah.

dikes intersect each other at right angles near the center of the deposit and have probably had some connection with the formation of the ore.

The ore occurs as a brown, iron-stained quartz carrying silver as chloride and sulphide. Bunches of high-grade silver-lead ore are sometimes encountered; this is shipped directly to the smeltery at El Paso for treatment. An analysis of the ore is as follows: Lime, 12 per cent.; zinc, 2.5; iron, 4.5; lead, 0.5; magnesium, 2.4; silica, 62; carbonic acid, 13.2.

Mining Operations

Underhand stoping by hand drilling is the method employed in mining the ore. All employees work by the day. Stoping and hoisting is done on the day shift only, but development work, of which there is about 200 ft. done each month, is carried on by two shifts.

It is impossible to state with any degree of accuracy the amount of ore developed in these irregular limestone deposits, but the mine has been operated continuously for 25 years, and is in as good a condition today as regards ore reserves as at any time in its history.

Milling Equipment and Operations

The ore is hauled 2½ miles by the road from the mine to the mill in 12- and 14-mule ore teams, the wagons holding 14,000 to 22,000 lb. Three teams are employed and make three trips daily with the exception of Sunday.

The pan-amalgamation process is used in the treatment of the ore. The mill contains 15 stamps, 12 pans, 6 settlers and large storage pulp tanks. When running at normal capacity, 4 tons of ore are crushed per stamp per day, through a 20-mesh screen, and a recovery of 85 per cent. made. The silver bullion which is about 900 fine is shipped to San Francisco. The mill is a frame structure, as shown by the accompanying illustration, and has been running for 25 years, but practically reconstructed during that time.

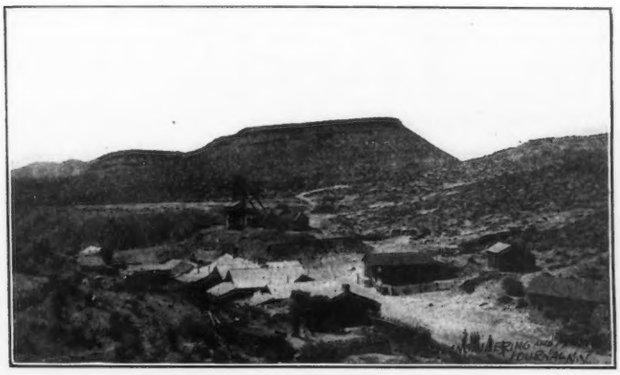
The power plant consists of three 60-h.p. return-tubular boilers and a 120-h.p. Reynolds Corliss engine. Wood was formerly used for fuel but the supply within a radius of 25 miles has been practically exhausted and crude oil from the Texas-Louisiana field is now used. It is hauled from Marfa in tank wagons holding 16 bbl. and built especially for the purpose. At the mill there is a well equipped blacksmith shop, carpenter shop, warehouses, etc.

Labor and General Conditions

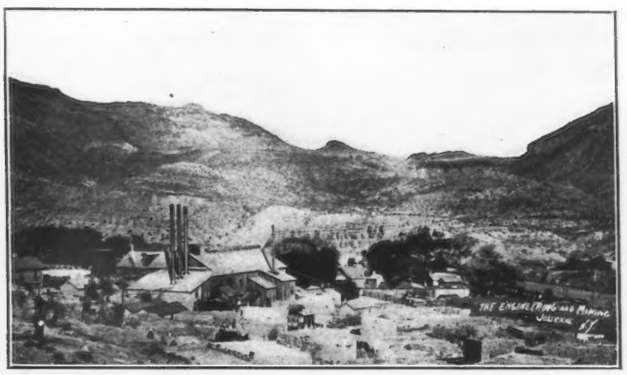
Mexican labor is employed chiefly, and is far superior to the average labor encountered in Mexico. The supply is plentiful. The white labor employed, foreman, mechanics, etc., receive the usual western wage.

Freighting from the railroad at Marfa to the mines is done entirely by Mexicans who receive from 20 to 40c. per 100 lb., according to the class of freight hauled. This, considering the distance (45 miles), is very cheap.

The population of Shafter is about 1000, nearly all of whom are dependent upon the mines for a living. The town has two stores which carry an immense stock for such a small place. The company has large boarding houses at the mine, and mill, assay office and drafting rooms are all of a high-class character. Good comfortable houses are provided, rent free, for the married white employees. The Mexicans construct their own houses or shacks, a number of which are shown in the illustration of the mill. The town is connected with Marfa by telephone. The Presidio Mining Company is a close corporation with offices in San Francisco, California.



OLD MAIN SHAFT AND OPEN CUTS, PRESIDIO MINE



PRESIDIO MILL AT SHAFTER, TEX.

Allentown Portland Cement Company

The Allentown Portland Cement Company recently completed one unit of a cement plant at Evansville, Penn., having a daily capacity of 2500 bbl. The company owns 452 acres of land, which contains a good quality of cement rock. This plant is the second one that has been built on the Reading system in this vicinity, and is so situated that it is able to supply a large local trade. The plant was designed and built by the Fuller Engineering Company.

The power house is 1000 ft. from the crushing and grinding plant and is equipped with three Wetherill cross-compound condensing engines, direct connected with alternating-current generators. The boiler plant has five 400-h.p. Babcock & Wilcox vertical boilers, fired by Lehigh stokers.

Operation and Equipment

The rock is mined at the quarry and loaded into cars with steam shovels and taken direct to a No. 10 McCully crusher by an electrically operated hoisting engine. The crushed material is distributed by elevators to three No. 6½ Lehigh gyratory crushers. From here the crushed product passes to storage bins. The bottom of the bins is equipped with automatic shaking feed which gives a constant flow of material to the driers. There are three driers 7 ft. in diameter and 50 ft. long. These are heated by waste gases from the kilns. The dried rock is taken to a second set of storage bins having a capacity of 5000 tons. From here it goes to two No. 8 Krupp ball mills, which prepare it for the Fuller mill. After the pulverized rock leaves the Krupp mill it is again distributed by elevators to storage bins above the Fuller mills. From the Fuller mills the fine product is conveyed to the four rotary kilns. The kilns are 8 ft. in diameter and 120 ft. long. Each kiln has a capacity of 700 to 800 bbl. per day. Two kilns discharge into a common elevator, which carries the clinker to rotary coolers. The clinker is crushed to ¾ in. and sent direct to 11 Fuller mills and ground to an impalpable powder. The finished product is sacked by the Bates valve-bag machine.

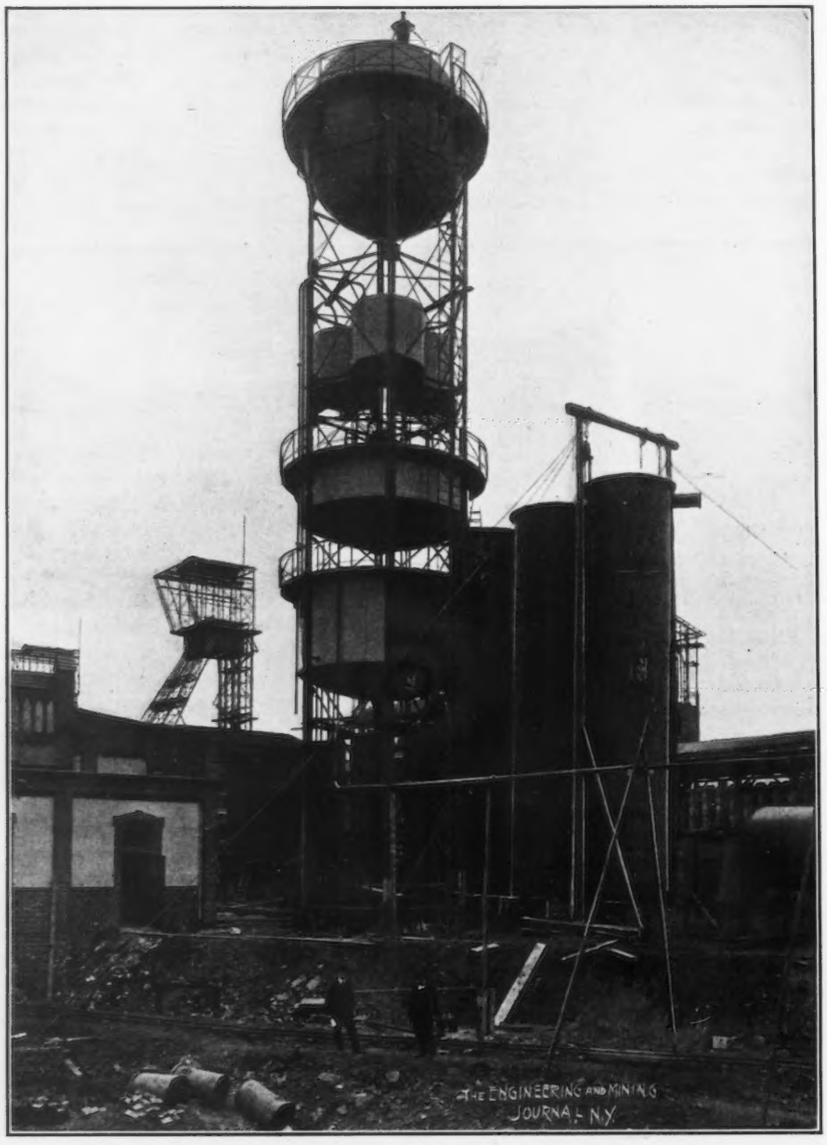
The plant will be driven by electricity throughout and will furnish one of the best examples of electrically driven cement plants so far produced. Each machine is driven by its own motor. The coal for the kiln is crushed by gravity rolls and taken to two driers, each 4½x30 ft. The driers are heated by waste gases from the kilns. The coal is then pulverized by two Fuller mills and passed over magnets.

The Klonne Type of High-level Storage Tank

Affords Advantageous Ratio between Useful Capacity and Weight of Structure; Whole Outside Surface Exposed; Construction Cost Is Low

BY A. GRADENWITZ*

Although a number of different types of high-level tanks have been suggested, none of these various designs have fulfilled all the requirements. While only few of them proved satisfactory from a technical point of view, even those were attended by serious drawbacks, such as that of expensive manufacture and installation. When, in 1883, the Intze patents were made known, it was generally believed that these embodied the highest stage of perfection possible in the construction of storage tanks. While constituting an important advance, this type, however, did not come up to the requirements in the long run, as the abutment ring was of difficult and expensive construction and attended by a number of defects.



TANK TOWER OF THE FRIEDRICH DER GROSSE MINE

The Klönne Tank

A novel type of high-level tank developed by August Klönne, of Dortmund, on plans by Prof. G. Barkhausen, may be said to avoid the bad points of its predecessors. While being practically perfect from a technical point of view, it is of cheap construction and affords the most advantageous ratio between the useful capacity and weight of the structure. The underframe is of great lightness and the whole outside surface is constantly exposed to daylight, thus allowing even the smallest leakage to be immediately noted and repaired.

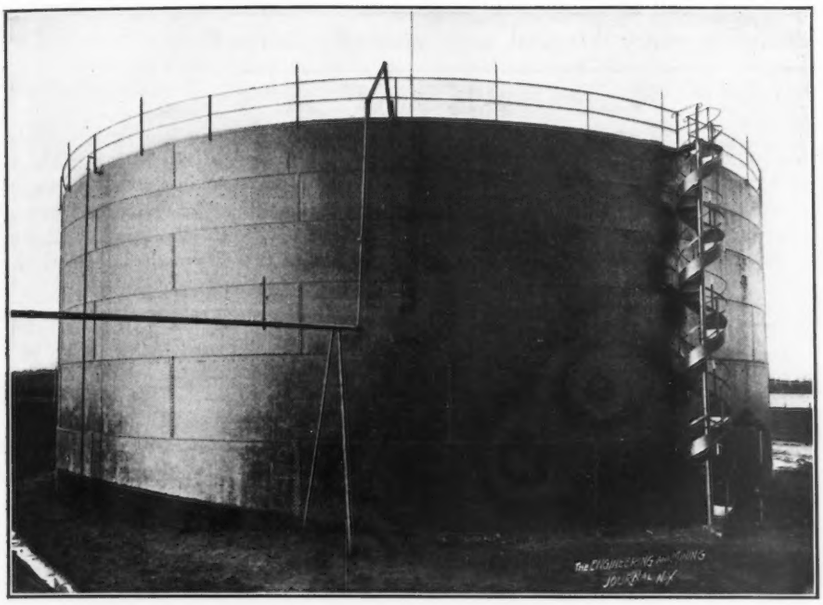
The bottom of the tank is free from any rings, and accordingly does not contain any angle; the transition between the bottom and the cylinder wall likewise contains no break. The bottom and wall are exposed in all their parts only to traction strains due to hydrostatic pressure (both radial and annular) so that the wall can be made relatively thin without reinforcement. The bottom consists of as simple-shaped metal sheets as possible.

A supporting member for vertical loads (also between individual struts) is used in the place of a special annular support; the vertical cylinder wall is provided with girder ties and vertical props. Deformations due to the load or to fluctuations in temperature entail no sliding on the support, and the bottom is accessible from all sides. The tanks consist of a cylindrical wall and the bottom, which is connected without any break of continuity with a vertical tangent. While any shape desired can be adopted the hemispherical

SULPHURIC ACID TANK OF THE KÖNIG LUDWIG MINES

*Berlin, W. 50, Regensburgerstrasse 3.

form is generally preferred. In the case of tanks intended for coal-washing plants, steep sliding surfaces are the most advantageous. The vertical cylinder wall obviously can be provided also on the top with a similar cap to the bottom, which at the same time forms the roof of the structure, allowing the upper portion to be conveniently utilized. In order to eliminate any compression stresses the ratio between the cylinder sleeve and the bottom should be chosen conveniently.



OIL TANK 28 M. IN DIAMETER AND 10 M. HIGH RECENTLY ERECTED AT SCHULAN

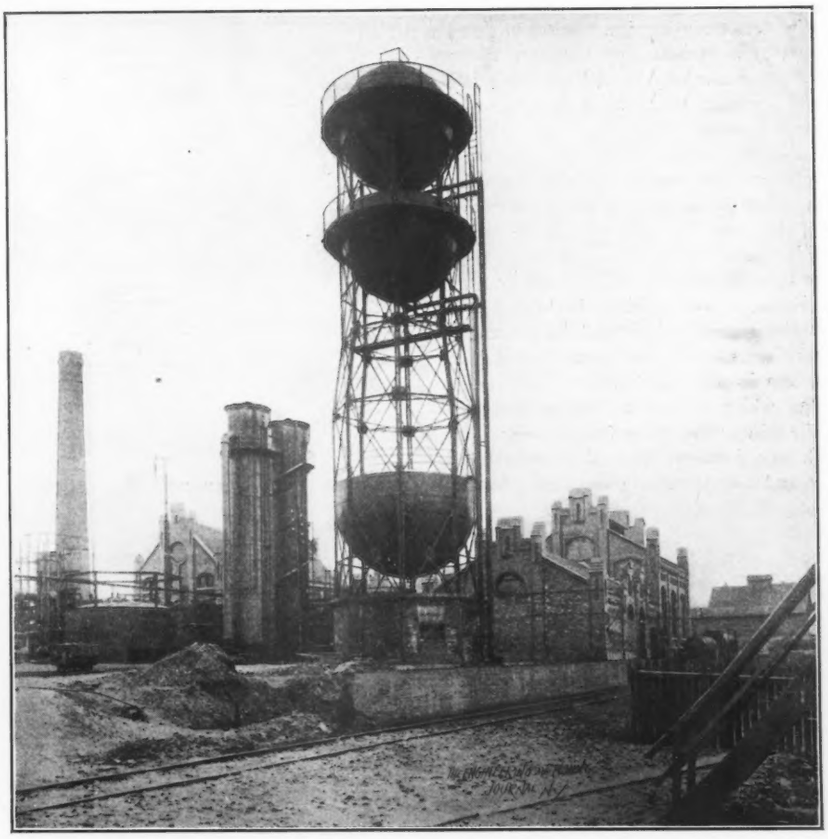
The wall is provided with substantial vertical struts above the points of support where the whole of the load has to be transmitted. As, however, the whole load of the tank is concentrated on the inside of these struts (which must not project inwardly) the radial sections of the struts are chosen as flat as possible.

The cylinder wall is utilized as a girder between the points of support, although the tank has a complete masonry base, the vertical ties inserted into the wall being prolonged beyond the lower edge of the cylinder wall to an extent agreeing with their rigidity, thus increasing the hight of pressure and disengaging the tank from all sides.

Installations

The accompanying illustrations represent some typical instances of this type of high level tank. The tank tower of the Rhein-Preussen coal mines is intended for a coking plant. The uppermost tank contains clear water, the middle tank, ammonia water, and the lowermost tank, tar. The tank tower of the Friedrich der Grosse mine is likewise intended for a coking plant, its various tanks containing the different by-products yielded by coal distillation.

The sulphuric-acid tank of the König Ludwig mines is free from any discharge pipe on the bottom, so as to avoid corrosion, the discharge pipe being arranged on the top. The concentrated sulphuric acid is discharged from the top by atmospheric pressure through a tube immersed in the liquid. There is also shown an oil tank 28 m. in diameter and 10 m. in hight recently erected at Schulan.



TANK TOWER OF THE RHEIN-PREUSSEN COAL MINES

Boston & Corbin Copper and Silver Mining Company

The annual report for the year ending July 31, 1909, states that during the year 3236 ft. of crosscuts and drifts were run on the various levels. The main working shaft was extended 174 ft. as a double-compartment shaft. Later in the year the entire shaft, 700 ft. deep, was enlarged to three compartments by raising from the bottom to the surface. Electrical machinery has been installed and will be operated by power from the Missouri River Power Company. The company has about $185,000 cash in the treasury with no liability except its 90,000 shares of capital stock and a small amount of outstanding bills. It is expected that ore shipments of 300 tons per day will be made within the next few months. In addition to copper the ore carries some gold and silver.

It is reported by Consul Lester Maynard, of Vladivostok, that the German firm of Schultz & Co. has decided to work the oilfields of Sakhalin island. It intends erecting a plant with a capacity of 1,000,000 cases of kerosene and 1,000,000 cases of crude oil per annum. Three wells will be bored and two large pumping stations erected. In addition, there will be a tin-can factory, boiler and repair shops, and a box factory.

Examples of Modern, Sanitary Dry Houses

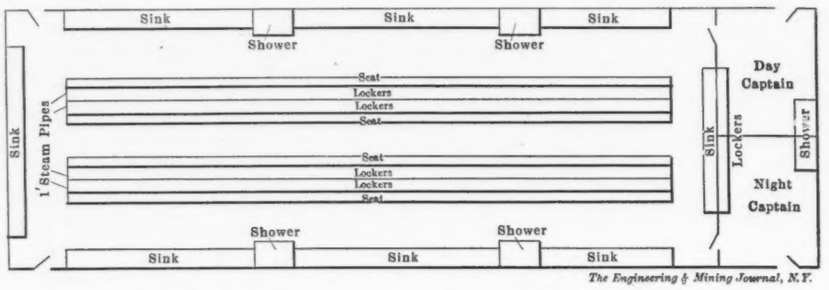
Constructed of Brick, Sheet Iron and Concrete; Equipped with Steel Lockers, Shower Baths, Emergency Hospital and other Appliances

BY ALBERT H. FAY

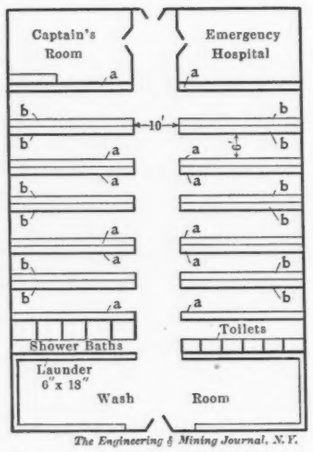
In too many instances the personal or human side of mining is overlooked. The health and comfort of the miners is a point that it is well for every mine manager to bear in mind. The sanitary conditions of the change room is something that can be improved, in many instances, at a nominal cost. Unless these rooms are kept perfectly clean, good opportunities are presented for germs to breed and thus spread contagious diseases. Vermin are found in many of these buildings where the men are compelled to change their clothes when on their way to and from work. The buildings shown in this article are in the Minnesota and Michigan iron districts, and more attention is given to heating than would be necessary in a warmer climate.

Oliver Iron Mining Company

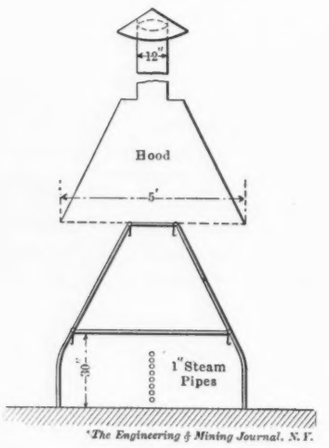
The accompanying illustration in an example of a modern and uptodate change room now used by the Oliver Iron Mining Company, at all its new properties; it is also being built at the older mines as soon as the old buildings are beyond redemption. The building is 40x125 ft., one story high. The outside of the structure is sheet iron, veneered with brick on the inside, making the wall about 5 in. thick. The floor is concrete with ample drainage provision. The building is heated with exhaust steam and lighted by electricity. There are two double rows of steel lockers, 250 in all. Each man is assigned a locker which he uses as long as employed at the mine. There are four shower baths, each one inclosed in a sheet-iron room. Hot and cold water are supplied. Around the walls of the building are 8 porcelain sinks composed of sections about 3 ft. long which contain 2 porcelain wash basins per section. In this way each man can have clean water in which to wash and there is almost no possibility of spreading disease, as no two men will use the same water. Just above the sink are the hot- and cold-water pipes with faucets for each section of the sink. The lockers are placed back to back and beneath each row are four 1-in. steam pipes. The heat rising through the grating in the bottom of the locker soon dries the wet clothes. There are also two steam pipes along the side of the building. These are placed in the floor in a concrete trough under the sinks and are covered with sheet iron. A bench extends the entire length of each row of lockers, which gives the men a comfortable place to sit while dressing, or eating their lunch. The room is well supplied with windows above the sinks. Clean empty powder boxes are placed in front of each row of lockers for



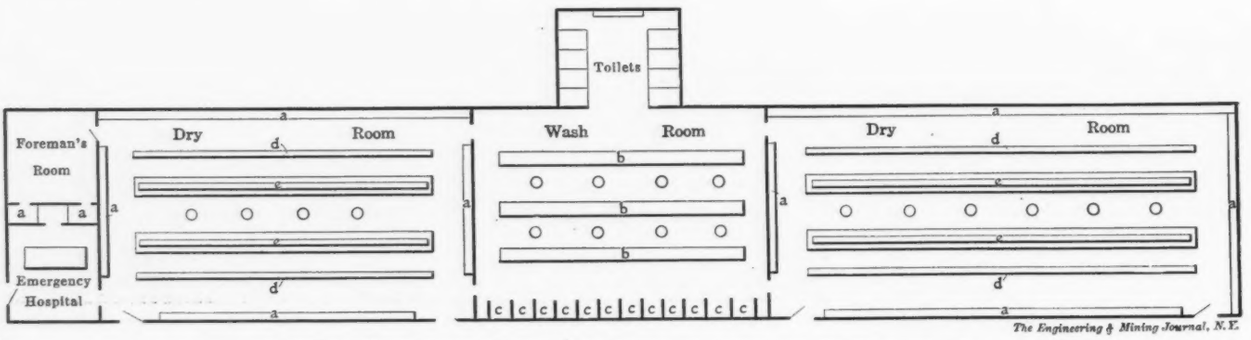
GENERAL PLAN OF CHANGE ROOM, OLIVER IRON MINING COMPANY



REPUBLIC IRON COMPANY'S DRY HOUSE

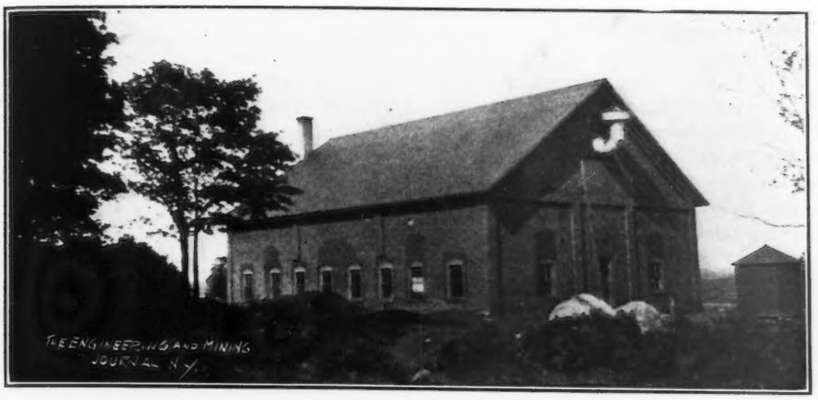


CLEVELAND CLIFFS DRY RACK AND HOOD



GENERAL ARRANGEMENT OF DRY HOUSE USED BY CLEVELAND CLIFFS COMPANY

the men to throw scraps from their lunch. Ventilators pass out through the roof, but no hoods are used. A caretaker is in attendance both day and night and keeps everything clean. In case any locker becomes infested with vermin, the caretaker opens it, removes the man's clothes and washes the locker out with hot water.

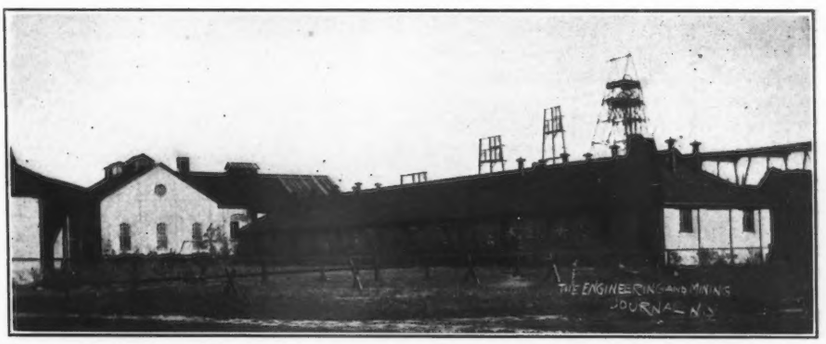


REPUBLIC DRY HOUSE

In addition to this change room for the men are two other rooms, one for the night captain and the other for the day captain. Each is fitted with lockers, shower bath, desk and chair. The accompanying sketch shows in general the details of construction. No provision is made in this building for an emergency hospital.

CLEVELAND CLIFFS IRON COMPANY

The dry house of the Cleveland Cliffs Iron Company is 34x200 ft., and is built of brick. The walls are 9 in. thick and the floor is concrete. At the end nearest the mine is a small room used as an emergency hospital, in which is an operating table, and at one side is a medicine closet containing emergency supplies. The door to this room is 5 ft. wide so as to give ample room to enter with a stretcher. By the side of this is the mine captain's room, in which are two closets, one for him and one for the man who takes care of the building. Along the side of the walls are steel lockers *a*, in which the miner puts his street clothes. His working clothes are not placed in these; therefore he always has a clean place for his other clothes. In the dry room are two rows of racks *e*, made of 1-in. pipe. The upper bar is about 6 ft. from the floor, while the lower one is 30 in. The lower bar is used for boots and shoes, while the upper bar is for clothes. Between the rack and the locker is a seat *d*. Just beneath the dry rack and in the center are eight 1-in. steam pipes placed one above the other. Above the dry rack are a number of hoods 5x15 ft., to take away all the odors arising from the dirty clothes. The hood terminates in a 12-in. pipe.



DRY HOUSE AT CLEVELAND CLIFFS PROPERTY

OLIVER DRY HOUSE

There are three launders *b* the full length of the wash room. These slope toward the center of the room, with a discharge pipe at *b*. The launders are 27 in. wide, 12 in. deep, semi-circular in form. They are made of ¼-in. sheet iron. On the top and in the center of the launders are the hot- and cold-water pipes with faucets every 5 ft. The space between the pipes and the edge of the launder is such that there is just room for the wash basin to be set on top. Steam pipes are placed underneath for heating purposes. Twelve shower baths *c* occupy one side of the wash room. On the other side of the room is an annex in which are 8 toilets. Six of these are for the miners and are left open all the time. The other two are for the machine-shop men, each of whom has a key.

In front of the building is a well kept lawn in which young trees have been planted. As in all other departments, the management takes pride in making this an attractive and comfortable place for the employees. This building is equipped for 500 men.

REPUBLIC IRON COMPANY

The building, which has been equipped as a dry house, was originally an engine house. It is built of brick, and is 64x90 ft. The floor is cemented, and there is a hall 10 ft. wide running through the center of the building. At the front is a room for the foreman or mine captain. Just across the hall is a room fitted up as an emergency hospital, in which is an operating table, medicine chest, and chairs, together with hot and cold water connections. There are 150 expanded-metal lockers *a* and 150 sheet-steel lockers *b*. The expanded-metal lockers are 18x18 in. x 5 ft. and used for the miners' street clothes. The sheet-metal lockers are 18x18 in. x 6 ft. and are the ones in which the working clothes are placed to dry. The sheet-metal lockers are as nearly air tight as it is possible to make them. Steam pipes are placed beneath the lockers. The top of the locker is connected direct with a ventilator so that no odor escapes in the room. Two men are assigned a pair of these lockers, each man, of course, working on the opposite shift. There are five

shower baths and five toilets. One end of the room is provided with launders, as shown in the drawing. These are 18 in. wide by 6 in. deep. Each locker is provided with a bucket which is used as a wash basin. In this way only two men use the same bucket. The building is well ventilated, has plenty of windows and is lighted by electricity. As the building is too far from the engine house to be heated by exhaust steam, a small boiler has been installed in the basement for heating the building and supplying hot water. An attendant is in charge of the building at all times.

Concentration of Flake Graphite

By Frederick D. Chester*

A number of graphite ventures have been a financial failure because of the low percentage of extraction. Occasionally this loss amounts to as much as 50 per cent., which is equivalent to handling an ore of half value, and as the expense is the same and the output one-half its theoretical amount, the yields may be insufficient to give a profit. Besides an efficient extraction, it is important that the resulting concentrates be as clean as possible, and in this respect some mills have failed.

Concentration of the Ore

Flake graphite as it occurs in nature, freed from every trace of associated gangue matter, is not a pure mineral, but one made up of a series of laminations between which are lodged variable amounts of mineral impurities varying from 10 to 25 per cent. To remove the latter, so as to bring the flake to a state of maximum purity and high carbon, these thicker flakes have to be split up, and the resulting thinner flakes rubbed clean of adherent impurities. This has so far been done on stone mills. By the grinding not only are the flakes delaminated, but the more brittle mineral impurities are ground to dust, which is subsequently bolted out from the larger more resistant flake. This process is repeated as many times as is necessary to give the flake the necessary thinness, and until it is essentially clean of foreign matter. This process of refining is applied to the dried concentrates, and the losses in the milling are largely dependent on purity of the concentrates.

I have been in mills which have made it a practice to grind concentrates which would not run over 25 per cent. of carbon, and there are few instances where these concentrates will run over 40 per cent. The milling of a sandy concentrate is ruinous, since it cuts the flake or grinds it to dust, and carbon in the form of dust is not worth over 3c. per lb, while as flake it is worth from 7 to 7.5 cents.

*Manager and treasurer, Chester Graphite Company, Chester Springs, Penn.

Losses Current in Milling

In order to give the losses current to milling a definite expression, the following formula has been derived, which gives results which I have found agree quite closely with the practice. In this a pure flake is assumed to contain 90 per cent. of graphitic carbon. If, then, a concentrate assays 60 per cent. of carbon it means that 30 per cent. of foreign matter has to be ground out of this concentrate, which gangue matter in the form of dust is mixed with more or less reduced flake.

It has been found that in the operation of grinding a concentrate twice, the average percentage of carbon in the resulting dust will vary from 30 to 40 per cent., depending upon the character of the concentrate, so that from these data it is easy to determine the theoretical proportions of pure flake to dust from a given concentrate.

Thus, let

w = Weight of the concentrate in pounds,

F = Weight in pounds of pure flake recovered,

c = Percentage of carbon in the concentrates.

Then

$0.90 - c$ = Percentage of impurities to be removed = s,

and

ws = Weight of impurities in w.

Let

p = Average percentage of carbon in the total dust produced,

and

x = Total weight of dust produced,

then

$$x = ws + px = \frac{ws}{1 - p}.$$

Then

$$F = (w - ws) - \left(\frac{ws}{1 - p} - ws\right) = w - \frac{ws}{1 - p}.$$

On the basis of the latter formula, we would get the results shown in the accompanying table from lots of 2000 lb. of concentrates of different percentages of carbon.

From this it is seen that the money value of the product of a mill is largely dependent on the character of the concentrate, and how important it is to bring these concentrates to the highest attainable degree of purity before they are ground. Of course, a mill handling a given tonnage of ore per day will produce a larger quantity of a low-grade concentrate than of a higher, and the output of a mill can be run up by grinding a lot of sandy concentrates, and making an equivalent amount of low-priced dust at the expense of flake, but, as has been shown, this is not profitable.

To get at the matter more exactly we will consider 1000 lb. of an 80 per cent. carbon concentrate as the highest ideal standard, then with lower percentages of carbon in the concentrates the quantities and values will be somewhat as appear in the second table. From this it is seen that between a concentrate of only fair value as usually encountered, and running 40 per cent. of carbon, and one of maximum purity, there is a loss of value from milling of nearly 44 per cent. If, then, a mill is capable of producing 2000 lb. of an 80 per cent. concentrate, or 4000 lb. of one averaging 40 per cent., it makes considerable difference in the profits whether the output from these two grades of concentrates be $109 or $60, possibly the difference between a profit and a loss.

RESULTS FROM 2000-LB. LOTS ACCORDING TO FORMULA.

Percentage Carbon in Concentrates.	Refined Flake Produced, Lb.	Total Dust Produced, Lb.	Pure Carbon in Dust, Lb.	Value of Flake Produced at 6½c. Net.	Value of Dust Produced at 3c. per Lb. for Carbon.	Total Value of Flake and Dust.	Average Value per Pound of Product.
40	334	1666	666	$20.87	$19.98	$30.85	1.54c.
50	667	1333	533.	41.69	13.39	55.68	2.71
60	1000	1000	400	62.50	12.00	74.50	3.70
70	1429	570	171	89.51	5.13	94.44	4.70
80	1715	285	85	107.18	2.55	109.73	5.48

It is also seen from the accompanying table that the difference between an 80 and a 70 per cent. concentrate is not great enough to pay for the extra cost of refining above the 70 per cent. limit. But that below 70, while the percentages of carbon in the concentrate decrease in arithmetical ratio, the values of the product decrease in something like geometrical ratio.

Summary of Commercial Consideration

It may now be asked, is there any set of conditions which will determine the profitable production of graphite, and which may be applied to any enterprise. An attempt might be made to answer the question as follows: (1) A cost of mining not to exceed 50c. a ton, and of milling not to exceed 75c.; (2) a yield of marketable graphite, calculated as graphitic carbon, of not less than 40 lb. to the ton of ore handled; (3) the production of a concentrate to contain not less than 65 per cent. of carbon; (4) a return from the sale of the product of not less than 7c. per lb. for the actual carbon in the refined flake, and of 3c. per lb. for the actual carbon in the dust. Under these conditions an ore yielding 40 lb. of actual carbon will be worth approximately $2 a ton,

and a mining and milling cost of $1.25 a ton, will leave a profit of 75c. a ton.

Thus it appears that a mill must have a rather large tonnage capacity to realize much of an interest on the investment, cover repairs, renewals, and provide a sinking fund to redeem the investment within the productive life of the mine.

It must be understood that a low-grade graphite ore at the existing prices of the product will not pay for deep mining at any greater cost than enumerated. From what has been written it will not be difficult for the officers of a company, not satisfied with results, to institute an inquiry, and to determine the real condition of affairs existing. Very often officials and stockholders realize that something is wrong in their company without knowing the cause, and the employees, anxious to retain their positions as long as possible, make plausible showings of total output; the financial balance, however, is always on the wrong side.

QUANTITIES AND VALUES OF VARIOUS CONCENTRATES.

Percentage of Carbon in Concentrates.	Proportionate Weights of Concentrates in Lb.	Average Value of Flake and Dust Produced.		Percentage of Loss in Value.
80	1000	@ 5.48c.	$54.80	0
70	1143	@ 4.70	53.72	1.97
60	1333	@ 3.70	49.32	10.00
50	1600	@ 2.70	43.20	21.20
40	2000	@ 1.54	30.80	43.90

Causes of Variations in Ore Sampling

By Thomas Kiddie*

There are a number of approved mechanical ore samplers in use, each kind having its own advocates, but so far as I know there is not any regular nor standard method of determining the accuracy or inaccuracy of these machines.

Ordinarily in sampling the personal element enters to some extent. A certain make of sampler is recommended and installed, and, there being no other sampling machine in use in the same establishment, those using it generally have no effective means of checking it against one of another style or make. As a consequence, the interests of both buyer and seller of the ores sampled are affected either adversely or favorably as the case may be, by the results obtained by such sampling through possible inaccuracy.

In my opinion tests to determine the accuracy of all samplers and sampling methods should include sizing tests as well as chemical tests, instead of, as by present method, chemical tests only, and if the value of the different portions of an ore increase or decrease more or less consistently with the size of the particles in the portions tested, as I believe it can be proved they do, then it follows that the machine or method of sampling which shows the least variation on analysis by sizing, gives the most accurate sample.

In the course of experiments made on the separation of metallic sulphides from silicates (or quartz) by the gradual crushing of sulphide ores having a hard gangue, it was found that the portions of certain constituents in those ores always increased and certain other constituents always decreased as the size of the portion tested increased, as shown by the accompanying tables of analyses and sizing tests.

From the above it will be seen that the percentage of silica and alumina increases with the size of the ore, although not apparently in accordance with any definite mathematical law, and that the gold, silver, copper, iron and sulphur decrease as the lumps are larger. These facts have been confirmed by tests of various lots of ores and will be found to conform to the experience of many metallurgists.

Applying this principle to the sampling of ores it would appear that analyses by sizing should prove the accuracy, or otherwise, of any sampling device. With this purpose in view, a Jones ore sampler, 10-in. size, fed with an ordinary mill sample, was tested, with the result that the proportions of the respective sizes, shown in an accompanying table, were discharged from opposite sides of the sampler, the total quantity of ore passed through the machine during this test having been 3016.5 ounces.

This shows a variation between the two sides of the sampler of 88 oz., or 2.932 per cent., and between the respective sizes, as follows: On ⅜-in. screen, 31 oz.; on ¼-in. screen, 32.75 oz.; on 1/16-in. screen, 7 oz., and through 1/16-in. screen, 17.75 oz. The results of this test indicate one serious source of error which may occur in determining the actual value of ores sampled by a riffle sampler. As further showing the variation in sampling, the accompanying table shows the result of a test to determine the difference between a sampling by riffle and cone methods, respectively, with 300 lb. of ore riffled down to 50 pounds.

From the chemical analyses of the ore and from the sizing tests contained in the foregoing tables it is clearly shown that there are great differences in the metallic contents of the various-sized particles, and results obtained vary considerably with the present methods of sampling. It is, therefore, necessary that a sampler, or method of sampling, shall deliver a sample containing the exact proportion of the different sizes contained in the ore sampled, and that in order to do this the personal element must be eliminated.

TEST OF JONES SAMPLER.

Screens.	Side A. Weight in Oz.	Side A. Percentage.	Side B. Weight in Oz.	Side B. Percentage.
Through ½- on ⅜-in.	824.50	56.319	855.50	55.105
Through ⅜- on ¼-in.	247.75	16.923	280.50	18.068
Through ¼- on 1/16-in.	198.25	13.541	205.25	13.221
Through 1/16-in.	193.50	13.217	211.25	13.606
Total.	1464.00	100.00	1552.50	100.00
	48.53%		51.46%	

To prove the accuracy of a sampling machine, or of any method of sampling, it would be necessary to make up a synthetic or artificial ore, by taking several weighed and previously assayed quantities of different-sized particles, and then mixing them so as to make up an ore, the composition of which, as regards the sizes and contents of its component particles, is shown. The whole of this artificial ore would be passed repeatedly through the sampling machine, and each sample thus obtained would then be passed through the same screens as were used in making up the ore, and the proportions of its several sizes be determined and compared with that of the original.

It would seem to be advisable that these determinations should be undertaken by a commission, or, as a preliminary step to that end, by the faculty of some school of mines or other like institution. If this were done and similar tests applied to all well known makes of sampling machines, we would then have absolute data obtained from a competent and independent source; whereas the results already published are usually those from one class of machine only.

It must be remembered that this investigation applies to one class of ore only, and that a wide field for investigation along these lines is open to anyone sufficiently interested in the matter to enter upon it. The application of this principle

ANALYSES OF SIZES.

	Original Ore.	On ⅜-inch Screen.	On ¼-inch Screen.	On 30 Mesh.	On 80 Mesh.	On 120 Mesh.	Through 120 Mesh.
Au, oz	0.22	0.22	0.20	0.18	0.38	0.43	0.24
Ag, oz	0.50	0.50	0.50	0.50	0.70	0.80	1.00
Cu, per cent	1.12	0.81	1.09	1.39	1.66	2.19	2.13
Fe, per cent	15.50	16.40	18.00	17.60	20.10	24.80	23.60
SiO, per cent	44.70	45.90	45.50	45.00	39.60	34.20	34.40
S, per cent	4.80	5.00	3.60	5.20	8.20	11.20	9.30
CaO, per cent	7.20	7.10	6.20	8.40	7.70	7.10	7.40
Al_2O_3, per cent	16.80	19.60	18.10	15.80	13.40	13.10	14.20
Sizing test: Percentage by weight.	100.00	78.25	11.00	7.68	1.25	0.34	1.48

*Metallurgist, Northport, Washington.

of separation of metallic sulphides by crushing has already produced satisfactory results in smelting by the adoption of such means as was found necessary to prevent such separation taking place, whereby a uniform ore charge was delivered to the furnace, resulting in an increased output and a general betterment in furnace conditions.

COMPARISON OF RIFFLE AND CONE SAMPLES.

Sample No. 1.	Riffle. Per Cent.	Cone. Per Cent.	Difference.
Through ½- on ⅜-in. screen	29.84	26.32	3.52
Through ⅜- on ¼-in. screen	36.62	32.61	4.01
Through ¼- on $\frac{1}{16}$-in. screen	17.42	26.18	8.76
Through screen $\frac{1}{16}$-in	16.12	14.89	1.23
Sample No. 2.			
Through ½- on ⅜-in. screen	7.9	8.23	0.4
Through ⅜- on ¼-in. screen	18.7	19.1	0.4
Through ¼- on $\frac{1}{16}$-in. screen	40.9	40.8	0.1
Through $\frac{1}{16}$-in. on 20-mesh screen	15.8	15.6	0.2
Through 20- on 40-mesh screen	9.1	8.5	0.6
Through screen 40-mesh	7.6	7.7	0.1

Since writing the above, Dr. J. Bonsall Porter, of McGill University, has kindly undertaken certain work in this investigation, which will be made the subject of a future joint paper.

VARIATIONS IN CONE SAMPLES.

Sizes.	A. Per Cent.	B. Per Cent.	Difference.	C. Per Cent.	D. Per Cent.	Difference.
Through $\frac{7}{16}$- on ⅜-inch screen	2.1	3.4	1.3	4.8	5.4	0.6
Through ⅜- on ¼-inch screen	11.8	16.0	4.2	17.2	21.4	4.2
Through ¼- on $\frac{1}{16}$-inch screen	43.8	44.3	0.5	44.0	42.2	1.8
Through $\frac{1}{16}$-inch on 20-mesh screen	17.5	16.0	1.5	15.5	14.0	1.5
Through 20- on 40-mesh screen	12.4	10.2	2.2	10.1	8.9	1.2
Through 40-mesh screen	12.4	10.1	2.3	8.4	8.1	0.3

Labor is reported as having been scarce at the Alaska Treadwell during the year ended May 31, 1909. Wages paid are as follows: Machine drillers, $3.50 per day (in pits $4.50); machine helpers, $3.25; mine laborers, $3; amalgamators, $120 per month; feeders, $100; vannermen, $95 to $130; machinists and helpers, $3 to $7 per day; blacksmiths, $5 to $6; tool sharpeners, $4.50 and blacksmith's helpers $3. Board at the company's boarding house costs $25 and room $2 per month. The average number of men employed was 676.

The report of the British Alkali Commissioner gives the production of sulphate of ammonia in Great Britain for two years as follows, in long tons: 1908, 313,281 tons; 1909, 325,228 tons. While the gasworks continue the largest source of supply there was an important increase last year from the coke ovens, owing to the greater number of by-product ovens in use.

American Borax Deposits

By Charles R. Keyes*

For years the principal supply of borax in the United States was the product of industrial chemistry. Suddenly, as over night, the entire borax industry has changed its methods and started out along new lines. Instead of laboriously obtaining various salts of boron by evaporating the waters of bitter lakes, by extracting them from the bottom crusts of desiccated ponds, by leaching them from boraciferous lake-muds, or by obtaining them through the heating of certain clays with sulphur in great retorts, it is now mined in the same way as are the metals or coal. From an industrial viewpoint the most important result is that it should now be possible to produce borax at a figure that is less than one-third of the price current a few years ago, and that it should enable the American product easily to command the markets of the world.

The recent discovery of enormous deposits of almost pure, crystallized borate minerals in the Tertiary clays of southern California promises an ample supply for the entire world for many years to come. Some of the localities have been long out of the beaten path of travel and without transportation facilities. At this time the geologic occurrence of the borate minerals is of more than usual interest and some of the facts lately observed seem worthy of more than passing notice.

Extent of Boraciferous Formations

The borate minerals occur in definite geologic formations. These terranes consist mainly of Tertiary clays of great thickness. They extend in a broad, semicircular belt around the southern end of the Sierra Nevada. From Death Valley and the Nevada line, they are exposed at short intervals for a distance of more than 300 miles to Santa Barbara, 60 miles north of Los Angeles. Along Furnace cañon on the east side of Death Valley and in the Amargosa desert, in the low mountains north of Daggett in the Mojave desert, in the Cajon cañon, and in the Santa Paula valley which opens out to the eastward from Santa Barbara, fine exposures give insight to the great extent of the Tertiary clays.

For a decade or more, Daggett has been the chief source of supply of American borax. Within the year, the Furnace cañon and Santa Paula localities have been so extensively developed that the poorer deposits of Daggett are not worked so extensively as they once were. Better borax deposits than any of those now operated and even more accessible to market are also ready for mining. Whether or not all of the borate deposits are on the same stratigraphic horizon is not as yet determined. Nor is it known with certainty that the several localities belong to the same geologic province. Presumably the clay beds are continuous throughout the entire belt mentioned.

Lithology of the Tertiary Terranes

Of the three major classes of geologic formations comprising the Tertiary of the region, only the great clay deposits need be especially considered in the present connection. The early acidic volcanics and the interbedded basic lavas require no further mention. Of the soft stratified deposits there are three rather distinct phases. At the base is a coarse conglomerate, which in the Death valley district appears to be confined to the eastern margin of the belt of finer deposits. It has a thickness at the south end of the Grapevine mountains of more than 3000 feet.

The second, marked phase of the Tertiary stratified deposits is called the older sand series. The entire section is composed of yellow to reddish, friable sandstones, rather massively bedded. These sandstones, so far as observable, nowhere merge into the conglomerates below; neither have they any conglomeratic facies. They have interstratified several layers of clays. The upper surface of the sandstones is very uneven; and apparently it was sub-aërially eroded before the overlying clays were deposited. Neither in the sandstones nor in the conglomerates below are there any evidences of the existence of borate deposits.

The third and uppermost lithologic phase consists of fine, alkaline, blue and olive-green clays, which weather to pale yellow or white. Numerous olivine-basalt sheets, 10 to 200 ft. in thickness, are interbedded. In the upper part of the succession occurs much crystalline gypsum (selenite), thick beds of crystallized borate of lime (colemanite), and thin strata of limestone, presumably of chemical origin. Thick beds of rock-salt are also reported to occur in several localities. So far as known no fossils are found in any of the formations.

The Borate Beds

The richer borate-bearing beds have a thickness of from a few inches to 40 or 50 ft. In the unweathered portions they consist of bluish clays thickly interspersed with milk-white, crystallized colemanite in thin layers, nodular bands and scattered nodules of all sizes up to a foot or more in diameter. This is termed locally the high-grade ore.

*Mining engineer, Des Moines, Iowa.

Throughout the beds carrying the coarsely crystallized mineral, the clays are more or less strongly impregnated with fine particles of borate minerals, which yield upon leaching 10 to 12 per cent. of anhydrous boracic acid. This is called by the miners the low-grade ore. While there are large quantities of this low-grade mineral in the several districts it cannot be utilized now to advantage in competition with the richer ores alongside of it. At Daggett, however, similar clays carrying as low as 6 per cent. of the borate in a finely divided condition is exclusively mined on a large scale by two of the principal borax producers.

Mingled with the coarse colemanite is often considerable amounts of crystallized gypsum in large plates. In places the gypsum becomes so abundant as to all but completely obscure the borate minerals. In the Furnace cañon there appear to be several distinct horizons at which the colemanite was deposited; but so far as is now known there is only a single level at which the mineral was formed in large quantities. This horizon is exposed on both sides of the Furnace valley. A very large amount of the mineral has been removed through the excavation of the cañon.

The clays associated with the borate beds are all very fine and entirely free from coarse materials, the colemanite crystallizations excepted. These clays when freshly exposed are blue in color, but soon change to olive-green, then to yellowish and finally nearly to white. As to their origin it has been thought that they are typical playa deposits, similar to those which are at the present time being formed extensively in many inclosed basins of the arid regions. It is more probable that the California borate-bearing deposits are mainly wind-blown desert dusts carried into shallow seas, arms of the latter becoming desiccated from time to time.

Methods of Mining

Depending upon the steepness of inclination of the borate-bearing beds and their associated strata, two distinct methods of mining are followed. When the beds are nearly horizontal in position and their main outcrops are in the sides of deep cañons, as in the Death Valley region particularly, the mineral band is simply drifted upon. A main entry is driven into the hill-side. From this, on either side, lateral passages are made and chambers opened up. In all respects the plan is that of the ordinary room-and-pillar method of mining coal. The mineral is loaded into small cars which a man pushes out to the mouth of the adit. Owing to the high cost of fuel and particularly to the especially favorable conditions for this sort of mine transportation it is not probable that power will be soon substituted.

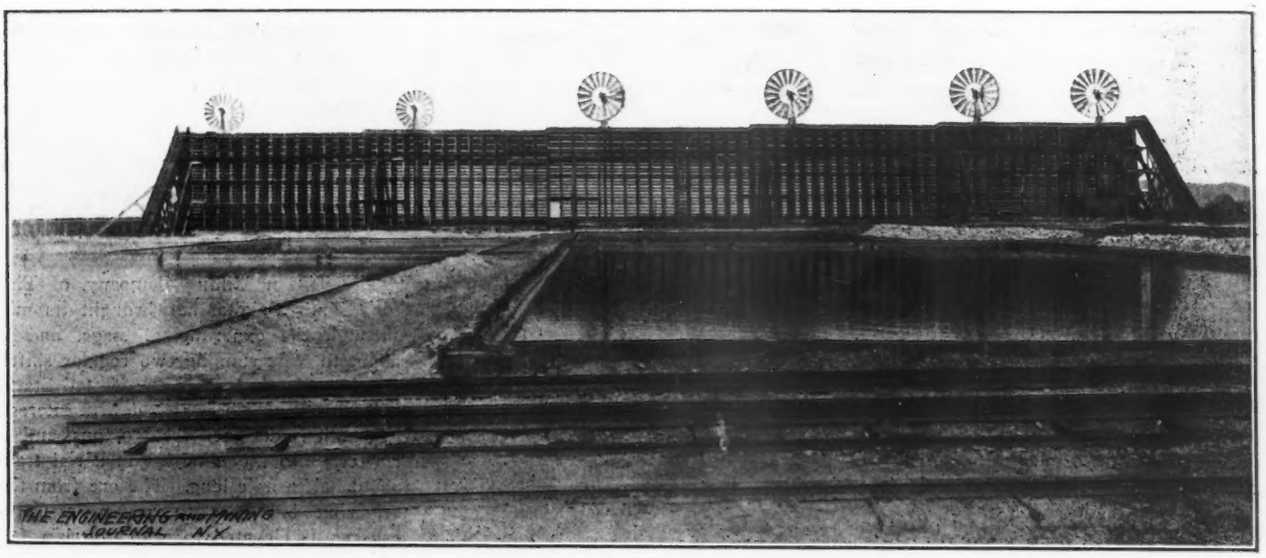
In the Santa Paula valley, where the borate beds stand nearly vertically, drifts are run in on the outcrop of the mineral near the bottom of a cañon and the mineral is stoped down in the several levels much as are metalliferous ores in fissure veins. In the present workings there are several hundred feet of mineral above the lowest level so that it is likely to be some time before it will be necessary to sink shafts or operate by inclines.

In the Mojave desert, the borate beds are also highly inclined. Shafts have been sunk to depths of 300 to 500 ft.; levels are opened every 50 ft. and the mineral stoped in the usual way. The hoists are run by gasolene engines. The low-grade mineral is hauled by steam to the extraction works situated on the main line of the Santa Fe railway, a distance of 8 miles. A view of the huge evaporating racks and concentrating vats is shown in the accompanying engraving.

Available Supply of Borates

Since the recent discoveries of the rich and extensive beds of colemanite, the low-grade mineral which has been so profitably worked in the past will no longer be taken out, and the few small mines which have been operating in such deposits have been already closed. While the new mineral bodies lately opened up are of sufficient size to supply the world with borax for many years to come, the operating companies have endeavored to control the entire visible supply by locating hundreds of mining claims covering all deposits known to them. That any person or company is permitted to do such wholesale locating of mineral lands indicates only too clearly some of the graver defects in our mining laws. In the particular instance just mentioned the seriousness of the situation happens to be largely mitigated by the fact that a large majority of the claims have been located with little regard to their real merit, and as a result they have little value.

Some of the best deposits are still unlocated and in these so far as now known there is an estimated available tonnage ample to supply the world for many years. One deposit alone which has not yet been touched is over 50 ft. in thickness composed entirely of the high-grade crystallized colemanite. It occupies an area of several square miles, at least. A single claim of standard size, 600 by 1500 ft., would contain about 3,000,000 tons, and a square mile upward of 100,000,000 tons. Yet before the recent general slump in mine products, commercial borax sold for 7c. per pound!



EVAPORATING RACKS AND CONCENTRATING VATS OF BORAX WORKS AT DAGGETT, CAL.

The only export tax in Mexico on minerals or mineral products is on gold or silver. All other products of the mines are exported free except for a nominal customs charge at the port of export.

The Boston Consolidated Mining Company

SPECIAL CORRESPONDENCE

On Oct. 7 and 8, 1909, members of the American Institute of Mining Engineers, returning from the Spokane meeting, visited the mines, mills and smelteries around Salt Lake City. The Boston Consolidated Mining Company prepared especially for these visitors attractive little booklets giving in concise form, data of the equipment and the operating costs, both at the company's mines in Bingham cañon and at the mill at Garfield. The "tabloid" form in which these data are presented readily appeals to the busy engineer, and they are presented below for the benefit of those who were not able to take this trip:

MINES AT BINGHAM CAÑON

Mines Area:
378.8 acres covering both sulphide and porphyry mines, which are separate mines.
Porphyry Mine:
Development—101,914 ft. underground workings.
Tonnage—37,439,000 tons porphyry ore above 1.5 per cent. copper content.
Mining Method—Present output obtained by caving methods, but mine is equipped for steam shoveling.
Sulphide Mine:
Development—47,536 ft. underground workings.
Mining Method—Square sets in stopes.
Equipment—Both Mines:
Tramway—4-track gravity tram—Stine.
Drums—Air controlled; lower 12 tons in car.
Length of tram, 2000 feet.
Elevation overcome, 737 feet.
Gradient, 24 to 55 per cent.
3000-ton cylindrical steel receiving bin.
Tramway, daily capacity, 6000 tons.
Four 90-ton steam shovels.
12 locomotives.
146 cars.
6 miles narrow-gage track.
3 electric-driven air compressors, 70 drills capacity.
80 rock drills.
Usual shops, warehouse, boarding houses.
Number of Employees:

Sulphide mine	102
Porphyry mine	427
Shops	19
Total at Bingham	548

SEPTEMBER MINING COSTS

Sulphide Mine:
Production—7178 (dry) tons ore. 310,000 lb. copper contents.
Square set method—Stoping ore.
Cost of Mining in Cents per Ton:

Breaking ore	29.1	
Mucking	35.2	
Timbering	50.1	
Electric haulage	9.6	
General expense	4.1	
Sulphide mine expense	12.0	
Cost of mining		$1.401
Development in waste		0.287
Total cost		$1.688

Porphyry Mine:
Caving method.
Production—71,880 (dry) tons ore.
Cost of Mining in Cents per Ton:

Breaking ore	18.8
Mucking	16.5
Timbering	7.7
Electric haulage	4.0
Gravity tram	2.5
Mine expense	5.0
General expense	2.2
Development expense	10.0
Total cost	66.7

GARFIELD MILL

Mill Site:
Area—910 acres.
Buildings:
Foundry—Steel building, 60x80 feet.
Equipment—Motor Driven:
No. 3 Whiting cupola.
No. 3 brass furnace.
No. 4 Root blower.
12,000-lb. jib crane.
Machine shop—Frame building, 44x178 feet.
Equipment—Motor Driven:
1—10-ton traveling crane.
1—36x24 triple engine lathe.
1—20x20 lathe.
1—No. 6 Barnes' vertical drill.
1—24-in. shaper.
1—No. 55 bolt and pipe cutter.
1—power pipe cutter.
1—No. 21 plate shear.
1—8-ft. Poole boring mill.
1—18-in. keyseater.
1—5-ft. Niles' radial drill.
1—1100-lb. Bement steam hammer.
Electric Substation:
Transformer building—Concrete and brick, 60x72 feet.
Equipment:
4—1000-kw. 80,000-460 volts Westinghouse transformers.
3—250-kw. 460-2300 volts Westinghouse transformers.
3—75-kw. 460-115 volts Westinghouse transformers (lighting).
1—Set 80,000-volt choke coils.
1—Set 80,000-volt arresters.
1—9-panel distributing switchboard.
Power transmission at 40,000 volts.
Distance—144 miles from Telluride Power Company's, Grace, Ida., station.
Crude Ore Bin:
Steel building, 300x36 feet.
Capacity, 12,000 tons.
Crusher House:
Steel building, 66x78 feet.
Equipment—Motor Driven:
2—No. 6 Gates' gyratory crushers.
2—No. 5 Gates' gyratory short head crushers.
Screens and conveyers.
Mill:
Steel building, 326x590 feet.
Crushed ore bin, 21x570 feet.
Equipment—Motor Driven:
312—1500-pound Nissen stamps.
Duty, 114 drops per min.; 6½-in. drop.
Capacity, 8.73 tons per stamp day.
299 Wilfley tables.
221 Johnston vanners.
312 Callow tanks.
Classifiers, launders, etc.
Flow from stamps by gravity throughout.
Tailings and concentrates flow from mill through one central tunnel, having 13 branches beneath mill.
Heating Plant:
Frame and iron building.
Equipment—Three 80-h.p. boilers.
Main Pumping Plant:
Brick building, 30x50 feet.
Equipment—Motor Driven:
1—3-stage Byron Jackson centrifugal pump; capacity, 3000 gal. per minute.
2—4-stage Wood centrifugal pumps; capacity, each, 1500 gal. per min. against static head of 380 ft. through 4316 ft., 20-in. wood pipe line.
Concentrate Bins:
Concrete.
Nine bins, capacity, 200 tons each.
Concentrates loaded by Browning crane into railway cars.
Assay Office:
Brick building.
Store Room:
Frame, covered with iron.

MEN EMPLOYED AT GARFIELD

Shops:			
Foundry	15		
Shops	21		
Electrical department	6		42
Mill:			
Unloading ore	10		
Crusher house	18		
Mill	114		
Loading concentrates	3		145
Clerical force	5		
Assay office	2		
Other outside labor	34		41
			228

September Operation:
Received 77,003 tons.
Milled 72,000 tons (dry).
Produced 3550 tons (dry) concentrates, containing 1,569,000 lb. copper.
Recovered 21.8 lb. copper per ton crude ore.
Average heads, 1.58 per cent.
Power required—Pumping 469,280 kilowatt-hours; milling, 989,265 kilowatt-hours; total, 1,458,545 kilowatt-hours.
Possible stamp hours, 224,630.
Actual stamp hours, 214,145.
Percentage run, 95.3.
Milling Costs:

	Cents per Ton.
Crude ore bin	1.09
Crushers	4.49
Stamps	21.97
Wilfley tables	2.45
Vanners	3.35
Launders	0.51
Callow tanks	1.01
Loading concentrates	0.44
Tailings dump	0.74
Water Supply	7.50
Heating plant	0.04
Mill expense	3.41
General expense	3.11
Total	50.11

OUTPUT PER MAN

From these figures can be deduced some interesting information as to tons of ore mined and milled per man.

Mining:

Tons of ore mined per day per man underground:	
Sulphide mine, square-set system	2.34
Porphyry mine, caving system	5.61
Tons of ore mined per day per man, all hands	4.81
Milling:	
Tons of ore milled per day per millman	21.0
Tons of ore milled per day per man, all hands	10.5
Tons of concentrates loaded per day per man loading	39.4
Mining and Milling:	
Tons of ore mined and milled per day per man, all hands	3.3

Credit for these unusually efficient operations is due to Lafayette Hanchett, general manager; L. S. Cates, mine superintendent; and A. J. Bettles, mill superintendent.

Tin Mining in South Dakota

The Tinton Milling Company, of Tinton, South Dakota, has brought its mill through the experimental stage, and is about to start running two regular shifts. As the only tin mill in the United States its progress will be watched with interest. The mill is designed for 150 tons, and is connected to the mine by an aërial tram about half a mile long. The ore from the receiving bin goes to a No. 3 Gates crusher, is elevated to a 100-ton bin, fed to two smaller Gates crushers and is elevated to the 100-ton crushed-ore bin. Thence it is fed by a challenge feeder to the dry elevator, to coarse shaking screens ⅝-in. aperture, oversize to No. 1 roll, undersize to fine screen 3/16-in. aperture, oversize to No. 2 roll, undersize to wet elevator to a Woodbury jig. Material for No. 1 and No. 2 rolls goes to the dry elevator and is returned to the screens. The first jig compartment gives shipping concentrate, the heads from the second and third go to Wilfley tables. The middlings from all three compartments is reground in rigid rolls and returned to wet elevator to jig. The slime overflow from the first compartment is thickened in a Callow cone and concentrated on a Wilfley slime table. The tailings from all three jig compartments and the tables go to waste. The middlings from the first tables are at present being run over the slime table. The heads from all the tables and the middlings from the slime table are shipped. It is estimated that a profit can be made from 1 per cent. ore.

Granby Consolidated Mining, Smelting and Power Company

This company owns large low-grade copper deposits in the Boundary district of British Columbia, and a large smelting plant. The report for the year ended June 30, 1909, shows that the capital stock is $15,000,000 in shares of $100 each; of these 15,000 are held in the treasury.

The ore mined and shipped to the smeltery during the year was 963,510 dry tons. The ore smelted, including 19,944 tons foreign ore, was 984,733 dry tons. The metals produced were 21,901,528 lb. copper, 335,521 oz. silver and 45,761 oz. gold; averages of 22.24 lb. copper, 0.342 oz. silver and 0.046 oz. gold per ton. The average price realized for copper was 13.22c.; for silver, 51.25c. The total mine development during the year was 9707 ft.; diamond-drill development, 8329 ft. The report of Manager A. B. W. Hodges says:

"At the mine during the past year little or no new construction work was undertaken, as all of that had been completed the year before and work was confined to developing the known orebodies and finding new ones with the diamond drill, which drilled over 8000 ft. of holes during the year, and our ore reserves are largely increased and we have ore in sight for many years to come.

"The grade of the ore last year was not as good as the year previous. This was for the reason that in some places on the 400- and 300-ft. levels and near the surface we have had to take out a lot of pillars and cave down a lot of ore, and in doing this everything comes down between the walls and consequently the grade is lower, but this is offset by the reduced cost of mining. In stoping in comparatively new orebodies, the higher and lower grades can be mined and selected at will, but when the workings have been worked for eight or nine years, a time comes when it is advisable to take everything out, consequently the ore cannot be kept as clean.

"Our three main tunnels and our large shaft are all equipped with electric locomotives, cars, crushers, etc., and can take out and crush from 4000 to 5000 tons per day, and all are kept in the best state of efficiency and all repairs and mine improvements are charged to daily operating expenses.

"At the smeltery a large amount of money has been expended in machinery and new construction. Two years ago it was decided to enlarge still further all the furnaces and converter plant so that we would have a smelting capacity of from 3500 tp 4500 tons per day, and all this work has gone on during the past year and we have everything finished with the exception of two blast furnaces, which are now undergoing alteration and which will be completed by October next.

"The blast furnaces were lengthened from 17 ft. 10 in. to 22 ft. 2 in., and made 4 ft. deeper. This was done by lowering the furnace floor and slag tracks 4 ft. These larger furnaces have shown a marked reduction in smelting cost, especially in the lesser slag losses, reduction in amount of coke used, and also in labor due to large capacity and bigger units.

"The converter plant was enlarged and modernized. Two of the old small converters were replaced by three electrically operated shells 84 in. diameter by 126 in. long, giving us one small stand and three large ones. A new 40x40x42-in. two-cylinder electrically operated blowing engine of 10,000 cu.ft. capacity per minute was also added. The converter plant now has a capacity of about 40,000,000 lb. per year. Also two large rotary blowers for the blast furnaces were added, each having a capacity of 100,000 cu.ft. per minute. All of our engine rooms containing blowing engines, electrical motors and generators are housed in steel and brick fireproof buildings."

The income acount for the year is as follows, averages being calculated on the total tons smelted:

	Amount.	Per Ton.
Realized for metals	$3,983,537	$4.05
Working expenses	$3,136,122	$3.19
Foreign ores purchased	166,280	0.17
Total expenses	$3,302,402	$3.36
Net profit	$ 681,135	$0.69
Mine explorations	$ 74,841	.....
Depreciation	10,000	.....
Interest	82,787	.....
Dividends, 2 per cent	270,000	.....
Total	$ 437,628	.....
Surplus for the year	$ 243,507	.....
Carried over from previous yr.	2,455,180	.....
Total surplus	$2,698,687	.....

Working expenses include all development and repairs; also freight, refining, selling and general expenses. There was expended on new construction and equipment $233,994; additional mining property, $11,952; a total of $245,946 for additions to property.

President J. Langeloth's report says: "In consequence of the enormous damage done by the great forest fires in August, 1908, which devastated a very considerable area in British Columbia, whence our coke supplies are received, and destroyed railroad bridges and trestles, no fuel could be had for several weeks and over one-half of the works had to be closed down.

"It is very satisfactory to report a material reduction in the cost of mining and smelting per ton of ore; these lower costs established during the last few months should be maintained during the current business year, and consequently the cost price per pound of copper reduced. Last year, this cost, after deducting the value of gold and silver, amounted to 10c., against 10.24, 10.14 and 8.35, respectively, the three previous years.

"The expected improvement in the price of copper did not materialize, mainly on account of the very large production, which for a considerable part of the fiscal year exceeded consumption, and this, up to a few months ago, was still considerably below what it was during the period prior to the panic. Of late these conditions have changed materially for the better."

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the eight months ended Aug. 31 are valued by the Bureau of Statistics of the Department of Commerce and Labor at $105,258,962 in 1908, and $100,955,684 in 1909; a decrease of $4,303,278, or 4.3 per cent. The leading items of export were, in long tons:

	1908.	1909.	Changes.
Pig Iron	26,452	37,805	I. 11,353
Billets, ingots & blooms	79,015	84,119	I. 5,104
Bars	33,440	53,614	I. 20,174
Rails	138,787	166,306	I. 27,519
Sheets and plates	67,162	107,735	I. 40,573
Structural steel	81,910	60,960	D. 20,950
Wire	90,081	101,221	I. 11,140
Nails and spikes	26,730	30,346	I. 3,616
Pipe and fittings	76,554	99,124	I. 22,570

The exports of mining machinery were valued at $2,619,005 in 1908, and $2,900,269 this year.

Iron and Steel Imports—Imports of iron and steel and of machinery into the United States eight months ended Aug. 31 were valued at $13,407,611 in 1908, and $18,174,492 in 1909; an increase of $4,766,881, or 35.6 per cent. Leading articles of import were, in long tons:

	1908.	1909.	Changes.
Pig iron	56,941	87,222	I. 30,281
Scrap	3,262	4,377	I. 1,115
Ingots, blooms, etc.	6,610	10,419	I. 3,809
Bars	14,316	9,944	D. 4,372
Wire-rods	7,796	7,606	D. 190
Tin plates	42,828	40,042	D. 2,786
Sheets and plates	1,524	2,225	I. 701

The only considerable changes were the decreases in tin plates and bars.

Iron Ore Movement—Imports and exports of iron ore in the United States, eight months ended Aug. 30, long tons:

	1908.	1909.	Changes.
Imports	424,963	954,718	I. 529,755
Exports	140,562	302,766	I. 162,204

Of the imports this year 550,672 tons were from Cuba, 275,943 tons from Europe and 106,944 from Canada and Newfoundland.

Imports of manganese ore were 119,255 tons in 1908, and 135,603 in 1909; increase, 16,348 tons.

At the Tennessee Copper Company's smeltery at Copperhill there was used for a time a jacket of chilled slag surrounding the junction of the breast jacket and the spout, with a view to preventing or minimizing the effect of breakouts at that point. This, however, has been discontinued. More careful calking of the joint, supplemented by a spray pipe, is giving better results and with less trouble.

Nevada Consolidated - Cumberland Ely

The approaching absorption of Cumberland Ely by Nevada Consolidated lends interest to the affairs of these companies, together with their subsidiary concerns, viz., the Nevada Northern Railway Company and the Steptoe Valley Smelting and Mining Company. The official reports of these companies are characterized by absence of frankness toward their stockholders; indeed, it may be more properly said by concealment of all essential details. It might be possible to unravel some things with the aid of collateral evidence, but it would be no simple job.

As to the entrance of Cumberland Ely into the affairs of Nevada Consolidated in the first place, we quote from the JOURNAL of Oct. 19, 1907, as follows:

"Early in the Ely boom the Guggenheims acquired the controlling interest in the Cumberland Ely Copper Company, which had some property of good prospective value in the district, together with some valuable water rights in the Steptoe valley. Having thus become engaged in the district, they began quietly in 1906 to buy stock in the Nevada Consolidated, and by the middle of the year secured control of the latter company through the ownership of 51 per cent. of its stock, for large blocks of which it is understood that $12.50 per share was paid. Since then the Nevada Consolidated has been a Guggenheim company, the old management having retired and all subsequent operations being conducted by Guggenheim engineers.

"It appears that the Cumberland Ely Copper Company profited more from this transaction than did the Nevada Consolidated. The latter was already far along with the construction of the railway and was going to have its own smelting works, which in the natural course of events would probably develop an important custom business. The company also owned the Georgetown ranch, about 2800 acres, north of Ely, which carried with it the right to the water of Murry creek—a continuous flow of 4,000,000 gal. per 24 hours, which Mr. Channing considered one of the most valuable assets of the company, inasmuch as it assured a supply of water capable of treating many times the amount of ore which the mines could produce. The Cumberland Ely Copper Company at this time had no mining development of great consequence, but owned valuable water rights on the other side of Steptoe valley.

"However, under the new management, the Nevada Consolidated relinquished its great advantages to the Cumberland Ely company, the two companies becoming equal partners in what the Nevada Consolidated might have had alone. The Cumberland Ely company was allowed to buy a half interest in the Nevada Northern railway, and the Steptoe Valley Smelting and Mining Company was organized to build the mill and smelting works, the Nevada Consolidated and Cumberland Ely each owning a half of this company. On the other hand, the Cumberland Ely company transferred its water rights to the Steptoe company. The location of the works was finally made at a place where the latter could be utilized, instead of just north of Ely as originally contemplated. Of course, this deal was not entirely disadvantageous to the Nevada Consolidated. It was provided with smelting capacity considerably greater than it had contemplated, at least to begin with, but certainly it lost the controlling position in the Ely district, which it would doubtless have retained if the Guggenheims had not acquired 51 per cent. of its stock."

In addition to the above statement it may be remarked that the consideration to the Nevada Consolidated, aside from the water rights, was 200,000 shares of Cumberland Ely stock at the valuation of $10 per share, or twice par. The management of the Nevada Consolidated had previously selected the site for its smelting works and was ready to go ahead with construction. A great deal of valuable time was frittered away in the process of allowing the Cumberland Ely company to butt in.

Nevada Northern Railway

This company owns and operates a railway extending from Cobre to Ely, Nevada, a distance of 140.4 miles, together with branches amounting to 22 miles, making a total of 162.4 miles, besides which there are five miles of sidings. The line is laid with 60-, 70- and 75-lb. rails. It was opened June 2, 1906. The company has seven locomotives, eight passenger cars, nine box freight cars, five cabooses, 16 flat cars and 50 ore cars. The capital stock of the company is $2,000,000, divided into shares of $100 each ("Poor's Manual of Railroads," for 1908).

Besides the capital stock of the Nevada Northern railway, there is a bond issue of $1,000,000, for the conversion of which 200,000 shares of the stock of the Nevada Consolidated Copper Company, or $1,000,000, is held in trust.

The Nevada Northern railway was very easy construction. It runs due south through the broad and gently sloping Steptoe valley. The curves are few, there is not a bridge on the line, only one or two cuts worthy of the name and scarcely any grading. In all respects the physical conditions were exceptionally favorable. The rise in elevation from Cobre to Ely is less than 1000 ft. The construction and equipment of the line ought not to have cost any more than the amount of the capital stock and bonds of the company. The last balance sheet of the company (June 30, 1909) shows property and equipment at $3,708,482. The amount received from Cumberland Ely by Nevada Consolidated was nominally $2,000,000 in stock of the former company. This stock was subsequently sold, to a large extent, in the market, and probably realized less than $10 per share. The official statements of the Nevada Consolidated indicate nothing specific as to these transactions.

Steptoe Valley Smelting and Mining Company

These works were built jointly by Cumberland Ely and Nevada Consolidated. Presumably each company supplied funds for it as required and received capital stock of the subsidiary in consideration therefor. As originally constructed, the works comprised a concentrating mill of 4000 tons daily capacity, and a smeltery of about 700 tons daily capacity. A power plant of 6500 h.p. was also provided.

Extravagant figures representing the cost of these works have been published, such as $7,000,000 for example. If such estimates have any basis, it is probably the figure at which the works are carried in the capital accounts of the two mining companies, rather than their actual cost.

A concentrating mill of 1,200,000 tons annual capacity ought not to cost more than $1,800,000. A smeltery of 250,000 tons annual capacity ought not to cost more than $1,250,000. A power plant of 6500 h.p. ought not to cost more than $700,000. These estimates, which foot up to $3,750,000, would allow for a good deal of extravagance. In its fiscal year ending Nov. 30, 1908, which covers the period of most active construction, the Cumberland Ely company reported that it had expended $1,190,522 "in development work at the mine and this company's proportion of the cost of construction of the Steptoe Valley Smelting and Mining Company's plant."

Nevada Consolidated

According to the report of this company for the year ending Sept. 30, 1908, five of the six sections of the concentrating mill were then in operation, two being on Cumberland Ely ore and three on Nevada Consolidated ore. The sixth section, expected to go into commission in December, was to be used for Nevada Consolidated ore, when the production of this company was expected to be at the rate of 35,000,000 lb. of refined copper per annum. By April, 1909, with additions to the concentrating and smelting plant, the rate of output was expected to be 50,000,000 to 55,000,000 lb. per annum. The additions to plant were made as contemplated, but the Cumberland Ely management not desiring to make any addition for its account, Nevada Consolidated thereby obtained a five-eighths interest in the Steptoe Valley company, although Cumberland Ely had the right to balance it at any time desired.

The cost of producing copper by the Nevada Consolidated was estimated by

Mr. Channing and by other engineers at 7c. per lb. In the quarter ending June 30, 1909, the company reported a production of 9,721,873 lb., which apparently cost 8.08c. per lb., or 6.8 per lb. if the profits of $124,299 from its share of the Steptoe Valley works and the Nevada Northern railway were deducted. The ore reserves at the end of 1908 were estimated at 20,000,000 tons, while in the opinion of Pope Yeatman, the consulting engineer, the possibilities for a large increase of tonnage were very great.

CUMBERLAND ELY

In the Veteran mine this company has an orebody that is believed to amount to about 4,000,000 tons. Up to Feb. 1, 1909, it had milled 177,589 tons which averaged 3.1 per cent. copper, yielding a total of 7,332,118 lb. of copper. In the quarter ending June 30, 1909, the company produced 5,332,701 lb. of copper from which the net earnings were $121,749, besides which $114,000 were received as profit from the smeltery and railway. On the same basis that the cost of the Nevada Consolidated copper in the same quarter was reckoned at 8.08c. per lb., the cost of the Cumberland Ely copper was 11.28c. per pound.

Oroville Dredging, Limited

The statutory general meeting of this company was held in London on Sept. 17, when a statement was made by the chairman, Frederick W. Baker, explanatory of the formation of the company and of the operations for the year ended July 31.

The company was originally an American company, governed by a board of directors in New York, but owing to the greater part of the stock being held in London, it was decided to organize an English company, the nominal capital of the new company being made equal to that of the capital of the American company on the basis of one share of £1 in the English company for each $5 share in the American company. The number of shares that had been exchanged up to Sept. 6, was 505,369 shares and a further number of 134,846 are about to be exchanged, making a total number of those who have joined or agreed to join the English company, 640,215 shares out of a total capital of 700,000 shares.

The accounts of the American company which are late in appearing, being only for the year ending July 31, 1908, instead of 1909, show a net income of $271,199. Dividends to the amount of $348,884 were paid, the balance being partly covered by the surplus account and the net debit being carried to balance. The report for the year ending July 31, 1908, contains a statement by W. P. Hammon, the general manager, describing the operations of the constituent companies of Oroville Dredging. These companies are the Boston & California Dredging Company, the Boston & Oroville Mining Company, the Oroville Gold Dredging and Exploration Company, the Bear River Mining Company and the Boston Machine Shop Company. During the year the dredging equipment of the company was reduced from twelve machines to three by the abandonment of the three old 3-cu.ft. bucket capacity Risdon machines. The other machines were improved at an expenditure of $122,131, equal to an average of 1.68c. for each cu.yd. of material handled. The profits of the companies, when compared with the previous year, have been reduced by reason of the extraordinary expenditure of $77,521. The operating expenses and the yield of the different dredges are given in tabular form, from which it appears that dredges, like battleships, become rapidly out of date and obsolete. The tendency is for the size of the buckets to increase, the larger machines being operated at considerably less cost. The larger type used at Oroville are 7-ft. buckets, while on properties neighboring to Oroville, 14-ft. buckets are used, operating at a cost of 3c. per cu.yd., as against a cost of nearly 7c. for the 7-ft. bucket machines at Oroville. So great is the saving in cost from the use of the larger machines that the company is considering the building of two 14-ft. bucket dredges at an estimated cost of £80,000, and the scrapping of most of the old machines. A general summary of the four dredging companies, forming Oroville Dredging, Ltd., is given in the accompanying table.

SUMMARY OF OROVILLE DREDGING COMPANIES

	Cu.Yd. Excavated.	Total Cost per Cu.Yd. Cents.	Returns Cu. Yd., Cents.	Net Revenue Cu.Yd., Cents.
Boston & California..	2,133,921	6.33	13.72	7.39
Boston & Oroville...	1,808,810	7.97	9.02	1.05
Oroville Exploration..	2,542,694	5.15	11.64	6.49
Bear River Mining....	835,799	9.82	7.73	2.09 (loss)
Averages..	....	6.72	11.16	4.44

Ore depth from 27.6 ft. to 31.7 ft.

AVERAGE EXPENDITURE.

	Cents	Per Cent. of Total Cost.
Labor and material, Electric power, Water.... current exp..	1.48	22.0
	0.77	11.4
	0.11	1.7
Repairs	3.61	53.6
General expenditure	0.43	6.5
Taxes and insurance	0.32	4.8
Total	6.72	100.0

Further average figures are:

Cu.yd. per acre	48,271
Yield per acre	$5,386
Expense per acre	3,244
Profit per acre	2,141

In consequence of the limited area that still remains at Oroville, estimated by Mr. Hammon last January at 10 years or 14 years, if the Bear River ground is included, the directors have been looking out for a new dredging area and have taken up a property in Colombia situated on the west bank of the Nichi river, about six miles above the town of Zaragoza, Antioquia. The nearest seaport is Puerto Colombia, which is about ten days by steamer from New York. The concession covers 22,000 acres, of which 310 acres have been proved by Keystone drills. The engineers have estimated the total yardage of this area at over 13,000,000 cu.yd., of an average gross value of 31.31c. per cu.yd. The working expenses are estimated at 8c. per cu.yd. The property has been taken over on the recommendation of W. P. Hammon and the purchase money has been paid. The titles are held by the Pato Mines Company, registered under the laws of West Virginia and 75 per cent. of the stock will be issued to the Oroville company and 25 per cent. will go to the vendors in addition to $35,000 purchase money paid in cash. Oroville Dredging, Ltd., propose to make a debenture issue of $62,500, carrying 8 per cent. interest in order to provide the funds for paying for and equipping the property. A dredge of the most modern type has already been ordered and it is expected to commence work early next year.

The Bradley Process

The Bradley process for treating copper ore, which has been repeatedly referred to by the daily press and T. W. Lawson, in connection with the Process Copper Company, is the invention of Charles S. Bradley. He is conducting experiments at the plant of the International Tin Company, Bayonne, N. J., a portion of which he has been using as a laboratory and testing plant for nearly three years. Mr. Bradley and his two sons are in control of the work, and the utmost secrecy is maintained. No information is given out at their office. The plant is equipped for testing ore in quantities that will approximate mill tests. The Bradleys are technical men and are spending all their time at the plant, in an endeavor to perfect a hydrometallurgical process for the extraction of copper from low-grade ore.

Graphite mining is becoming one of Utah's important industries. The Homber Mining Company, which recently opened large deposits of high-grade graphite near Brigham City, is receiving more orders for its product than it can supply. The company is arranging for the use of grinding machinery at one of the local brick plants until its own mill can be built.

Mine Explosion in British Columbia

SPECIAL CORRESPONDENCE

An explosion at the No. 2 mine of the Wellington Colliery Company, at Extension, Vancouver island, B. C., caused the death of 32 miners on Tuesday morning, Oct. 5. This is one of the island collieries known as the Dunsmuir coal mines, the largest holder in which is the Hon. James Dunsmuir, lieutenant-governor of British Columbia. The cause of the explosion has not yet been ascertained, but the general opinion of officials and miners familiar with the mine is that a blown-out shot ignited the coal dust within the comparatively small area affected. The damage to the mine is inconsiderable so work in it will be resumed in the course of a few days, after the provincial government inspectors shall have examined it and made a strict inquiry into the circumstances attending the disaster.

Chief Inspector F. H. Shepherd and District Inspector Alexander Dick have been at the mine assisting in the recovery of the bodies of the dead miners. The provincial mineralogist and James Ashworth (the latter a well known English writer on coal-dust explosions who has for some time past been engaged in solving some difficulties encountered at the mines of the Crow's Nest Pass Coal Company, southeast Kootenay, B. C.) have also been authorized by the provincial government to endeavor to discover the cause of the explosion.

Five or six years ago a fire in this mine caused the death of between 20 and 30 miners, but since then there has been no serious trouble at the property. Two experienced and thoroughly reliable firebosses examined the mine two hours before the recent explosion and reported all working places in good condition.

An Interesting Coal Case in Indiana

SPECIAL CORRESPONDENCE

A case that is attracting much attention, and one which will try legally a point never before decided in this manner in the coalfields of Indiana, is soon to be tried in the Clay county circuit court at Brazil, Indiana. It is the case of Abe Park and four others. They are suing President Lewis, of the United Mine Workers, Mr. Hargrove, national board member, and the officials of District No. 11. The men are each suing for $2000 damages, alleging that because of the fact that both the local and national organizations (Mine Workers' Union) deprived them of their working cards, they have been unable to work in any coalfield and have been prevented from earning a living for themselves and their families.

The trouble arose in March, 1908, in the Rosebud mine of the Vandalia Coal Company at Seeleyville. The men allege that one morning when they went to work they found notices posted at the mine by the State mine inspector, stating that the air in the mine had been found to be bad.

MINERS REFUSED TO WORK

The men refused to go to work and the mine was closed for two days. The company, then, it is charged, exercised a right they claimed to hold under the contract, that of deducting $2 from each envelop of the two hundred or more employees. The men threatened suit, and the matter was brought before the attention of the miners' officials of the district. The complaint recites that these officials made a proposition that if the men would withdraw their suits they could return to work. Twenty-nine of the men refused to do this, but got judgment for the $2 each and collected the same. This angered the officials of the mine workers who refused to take dues from these miners, for a period of 90 days, and at the expiration of that time, they were expelled and denied working cards. They also charge that all of the 29 men found work in the block coalfield by paying a membership fee of $10, but these five refused to do so, and brought this suit.

The officials of the miners against whom the suit is directed insisted that under the yearly contract, the operators had a right to deduct the $2 or a dollar for each day the men refused to work pending the investigation and consideration of any grievance, and they sought to enforce the rule or provision in this case.

Colliery Notes

When the insulation of a motor has become damp during a stoppage, suitable steps should be taken to insure that the insulation shall be dry before the working of the motor is resumed, in order that its base may not become alive.

Cables carrying electric current underground, when suspended, should be supported by leather or other flexible material, in such a manner as to allow of their readily breaking away when struck, before the cables themselves can be seriously damaged.

A recent attempt was made at a colliery to get cement behind the tubbing in a shaft, where a large quantity of water was coming in. A joint was made with wood at the bottom edge of the lowest casting, between it and the rock, the wood being bolted to the castings, and the joint made water-tight with oakum. The cement was then poured into the open space between the tubbing and the rock, through holes in the castings about 10 ft. above the bottom. The cement was put in under pressure, being sent down through a pipe in the proportion of 1 of cement to 2 of sand; by the time that the mixture got to the bottom, the cement had usually separated from the sand and was useless. When the cement was put in through a tundish by hand, without pressure, the concrete was good.

The reversing feature in mine fans is becoming more popular and is now regarded by many engineers as essential to the safe and efficient ventilation of a mine. The principal arguments favoring the reversing feature in mine fans are, (1) in case of a mine fire or explosion, the reversal of the air current will often retard the progress of flames or gases; (2) by reversing the current and using the hoisting shaft as an upcast each night during the winter months, ice will be prevented from forming on the hoisting guides. In compliance with the demand for a reversible fan, the Sullivan Machinery Company is building a ventilator with a steel hood, which latter is given a quarter turn when it is desired to alter the direction of the air. For this purpose the hood is suspended on circular steel plates or rings, and runs on roller bearings. Rotation is secured by a rack on the circumference of the bearing ring, which is engaged by a pinion, turned by a large handwheel in the engine room. Anyone about the mine can reverse the current instantly without stopping the fan. One of these ventilators has been installed at the Crown Hill mine of the Clinton Coal Company, at Clinton, Indiana.

In many mines, occasions often arise where the work can be done most safely and to best advantage with compressed air. Among such instances is the operation of coal-pick machines in driving headings, or entries. If the mine in question is equipped with electric energy, the electric wires can be brought quickly up to the working face or point of application. For just such cases where it is inconvenient to carry pipe lines to the face, and still where electric energy cannot be used advantageously, a portable air compressor has been designed by the Sullivan Machinery Company. This machine consists of a standard single-phase compressor, driven by a silent chain from an electric motor, both motor and compressor being mounted on a truck, with wheels to fit the gage of the mine track. One compressor of this type which was recently supplied to a coal-mining company, has a 10x12-in. air cylinder, furnishing about 175 ft. of free air per minute, at 150 r.p.m. The horsepower of the motor is 25, which easily maintains an air pressure of 80 lb. in the receiver. This capacity is sufficient to operate a coal-pick machine. In case mine track is not available in the underground workings, wheels with wide tires may be substituted for those with flanges, and the outfit can be hauled from place to place on the ground.

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Nevada Consolidated Buys Cumberland-Ely

Assuming that the stockholders of the respective companies ratify the action of thcir directors, Nevada Consolidated is going to purchase Cumberland-Ely, increasing its capital stock by 400,000 shares, and giving that for the 1,300,000 shares of Cumberland-Ely. If this program be consummated without hitch, it will conclude a curious record of mining finance.

Some years ago the Guggenheims having become interested in Cumberland-Ely, without much to show in that property, acquired a majority interest in Nevada Consolidated. Cumberland-Ely subsequently, by great good luck, developed an orebody in the Veteran mine. Then affairs were arranged, to the disgust of many shareholders of Nevada Consolidated, whereby Cumberland-Ely was allowed to join Nevada Consolidated in the construction of the Steptoe Valley smelting works, Nevada Consolidated receiving 200,000 shares of Cumberland-Ely stock.

Later on, strenuous efforts were made to effect a consolidation of Cumberland-Ely with Nevada Consolidated, but such resistance was offered by stockholders of the latter, that the scheme was given up. Recently, by the strange whirligig of time it was Nevada Consolidated that made overtures to Cumberland-Ely, and it was stockholders of the latter who offered the resistance, considering the terms to be not good enough. We have no doubt that there will be some stockholders of Nevada Consolidated who will think the terms too high.

However, the outcome is that Nevada Consolidated for 400,000 shares, which at the present market price—about $25 a share—would be worth $10,000,000, repurchases the half interest in the Nevada Northern railway, and secures in addition the outside interest in the Steptoe Valley smelting works, the Veteran mine, about $500,000 in cash assets (as of June 30, 1909), and a certain area of unprospected ground. Against the present purchase price is to be set the consideration received from the previous sale, its acquisition of Cumberland-Ely stock having been to a large extent marketed. Making this deduction, the present purchase probably stands equivalent to $8,000,000@8,500,000. For this Nevada Consolidated obtains interests in a reduction works and railway for which $2,000,000 and $1,500,000, respectively, would probably be liberal estimates, leaving something like $4,000,000@4,500,000 to represent the mining property. The Nevada Northern railway is making handsome earnings, and on the basis of its earning capacity, its value is doubtless much more than $3,000,000. Its earnings, however, are chiefly derived from the Nevada Consolidated business, and the present price may be considered partly as a premium for the recovery of what never ought to have been disposed of.

It is not worth while to undertake to go too minutely into calculations of value, for in this case the matter of present and prospective earning capacity on the part of Cumberland-Ely may be dwarfed by strategic or other considerations. Cumberland-Ely was admitted to the railway and smelting enterprises on the basis of equal partnership. It has preserved its footing in the railway, but in the smeltery Nevada Consolidated was permitted to increase its share by making an addition to the plant, so that it now holds a five-eighths interest, although Cumberland-Ely has the right to match the additions of the other partner and thus restore the balance. The management of these works for the joint account has been a highly complicated affair, and practically bound to lead to friction if the partners should become hostile. Heretofore they have been friendly, but it requires no great stretch of the imagination to conceive conditions under which the situation might be altered, as for example, the purchase of the control of Cumberland-Ely by some other interest. Possibly this is the real inspiration for the present consolidation, Nevada Consolidated having been led to part with its fine strategic position, the present procedure is probably the best way of regaining it and avoiding a mess in the future.

Undercurrents in the Copper Trade

The animosity between the "Guggenheims" and the management of the United Metals Selling Company, which is an old story, is now being ventilated publicly. The particular grievance is that the "Guggenheims" persist in selling their copper for what it will fetch in the market as fast as produced, whereas other interests would like to manipulate the market by withholding supplies until consumers would be compelled to pay the price demanded.

This idea is reminiscent of the abandoned policy of the Steel Corporation in its branch of trade. There is, however, the difference that the steel producer tried to bring the consumers to terms by restricting its output, while the copper producers want to keep up their output at the highest rate on record and finance the surplus with the bankers up to the day when the consumers will take it off their hands.

Undoubtedly, there are interests that would like to bring about a combination or an agreement for "the betterment of the industry," rumors of which are continually cropping up. Two big stumbling blocks are the Calumet & Hecla and the "Guggenheims," besides which there are others. The present Calumet & Hecla management might be removed by the purchase of that company, but the price required seems to be regarded as too high.

With regard to the "Guggenheims," their name has come to be more or less a figure of speech insofar as the Smelting company is concerned. There are now but few of the family in the American Smelting and Refining Company, and the management of that concern is chiefly in the hands of their former lieutenants, while the actual ownership of the company is believed to be divided among the general public. Some strong interest could doubtless secure control by buying the stock in the market, but here again the price required is deemed to be too high, while moreover even if control were secured, it is possible that a large portion of its present accredited copper output might be diverted, so complicated are the wheels within wheels. History does actually record a happening of somewhat that character.

The irritation that is now manifested among the copper producers indicates that the situation is getting on their nerves. Publication of the monthly statistics of the association is even deplored in an unobtrusive way. Yet, these statistics have been the best possible thing for the copper trade, on both sides, during the current year. Even if the consumers could be kept in the dark as to the situation, while the producers possessed an illumination for their own benefit, the condition would not inure to their steady welfare. As a matter of fact, under the old regime, the producers were often as hopelessly in the dark as the consumers, e.g., in the spring and early summer of 1907. Again, toward the end of 1908 the producers practically without exception were of the opinion that the previous accumulation of copper had been absorbed and they were able to lift the price to 14⅜c. When at the beginning of 1909 certain producers awoke to the fact that not only was the accumulation unabsorbed, but also that production was enormously increasing, they became persistent sellers, and the price was speedily depressed to 12⅛c. The effect of statistics as to the situation of the industry is to eliminate the tendency toward sharp rises and falls; and steady the market. During the last six months the range of price has been comprised within 1c. per lb. In 1908, before we had the statistics, the extremes were 2¼c. apart.

The Lead Control in Europe

The agreement among a large number of the foreign lead producers has now been in effect for about six months, and the result is said to have been satisfactory. The purpose of this agreement was to bring out a healthier state of affairs in the lead market, the chief aim being to prevent violent fluctuations of price and to establish a level of price that will permit of steady continuous production. It was proposed to attain this end by arranging for a control over sales.

The organization of the producers was effected as stated in the last semi-annual report of the directors of the Broken Hill Proprietary Company, as follows: "In order to endeavor in some way to control the disposition of the world's supply of lead, an influential conference of the chief producers was held in Paris for the purpose of formulating an agreement by which more even prices could be maintained for the metal and less variation in the selling price than has appertained hitherto. The Proprietary company was invited to join in the conference, and the chairman of the London board (Mr. Dutton) was appointed to represent it. After several meetings an agreement was finally come to for the regularization of lead prices, but not to inflate prices further than the law of supply and demand allows. An influential committee was formed in Paris, of which Mr. Dutton was elected president."

The parties to the agreement comprise all of the Australian, Spanish and Mexican producers (including the American refiners who export Mexican lead), together with many of the producers in Belgium, France, Germany and Great Britain. In the aggregate about 75 per cent. of the foreign production is represented. All of this production is by the agreement sold by the Metallgesellschaft, Frankfurt-am-Main, and Henry R. Merton & Co., Ltd., of London, who dispose of the product pro rata for the account of the various members. There is no agreement for the curtailment of the production, but the members, or their representatives, hold occasional meetings, at which they compare notes, and presumably govern themselves according to the information obtained as to the state of the industry.

The tariff that surrounds the United States, of course, prevents any influence upon the American price for lead during most of the time. In so far as the foreign market is concerned the association appears wisely to have refrained from any attempt to strangle consumption. In fact since its organization the price for lead has rather steadily declined, the average for April having been £13.297 and for August only £12.475, though lately it has risen a little. This result has been characterized in some quarters as a fiasco on the part of the association, but that hardly seems to be the case. There is no doubt that the consumption of lead in Europe this year has been relatively small, which has resulted in the accumulation of a considerable stock, and the selling agents for the associated producers have showed their wisdom in bowing to the situation.

The Situation in the Zinc Industry

We are at last becoming able to see somewhat of how conditions are going to adjust themselves under the new tariff. The latter acted promptly to raise the price for spelter which is now at about 6.2c., St. Louis, against a range of 4.6 to 5.25c. during the first half of the year. Coincidently the price for ore has risen and the smelting margin has continued narrow, having been only about $11 per ton so far this year. During the first half of the year the ore production of the Joplin district was about 146,000 tons, and of Wisconsin about 29,000 tons, compared to 260,000 and 58,000 respectively for the two halves of 1908, demonstrating rather conclusively that a price for spelter of less

than 5c. did not check production in those districts. In the third quarter of 1909, Joplin produced about 74,000 tons (about the same rate as in the first and second) while Wisconsin turned out about 21,000 tons, a noteworthy increase. During this period the price at London was rather steady at 4.60 to 5c., or at substantially the usual difference below the American price, until lately; at present the price at London is about 5.05c. against 6.35c. at New York. The tariff on spelter is now 1⅜c. and a difference of 1½ to 1⅝c. would probably permit importation for consumption on the Atlantic seaboard. Consequently there is still room for a further rise in spelter before the danger of importations will impend, but obviously we shall need to keep our eyes more closely on the European market than formerly. If for any reason the price at London should fall to £19 = 4.13c. which is the minimum contemplated by the convention, the price at New York would have to come down to something like 5⅝ cents.

Anyway, we shall now become accustomed to seeing the American price for spelter far above the foreign. The difference will be determined by the demand for consumption, and by the supply of ore. The new scale of price has not yet been in effect long enough to determine its effect upon consumption. Nor can we yet forecast clearly the matter of ore supply. At present the smelters are well provided, having laid in large stores in advance upon which, of course, they are now realizing a fine profit. The miners who are furnishing the current supply of ore are also enjoying a greatly increased profit. The consumers are paying the bills. The tariff had an instant effect in raising prices, which was expected and for which it was wanted, but the action of the tariff would have been far less spectacular if its imposition had not been coincident with a great awakening of demand for spelter, the result of which has already been to remove the surplus stock and at the same time absorb the current production that is going on at a substantial increase over the rate of 1908.

The increase in the price for spelter is stimulating the production of ore in the country west of the Rocky mountains, where there is a keen demand for almost any zinkiferous material of a reasonable kind. This is, of course, a perfectly natural result. Given a price sufficiently high a production would be stimulated from the ore resources of Tennessee that may yield from 1 to 2 per cent. of zinc. There is, however, a limit to the price in the difference that will permit imports of spelter from Europe or of zinc ore from Canada and Mexico. We are likely to see again the importation of ore; indeed certain kinds for special purposes are now being imported; but present conditions do not permit a general importation.

Foreign ore will have to pay a duty of 1c. per lb. on 100 per cent. of its zinc content and 1½c. per lb. on its lead content if entered for domestic consumption. But if to be smelted in bond the smelter may liquidate by delivery of 90 per cent. of the metals. Undoubtedly there will be more or less smelting in bond for a spelter product that may be marketed in Mexico and Canada and in this country with galvanizers and others who will export it in the form of manufactures upon which drawback may be collected. All of the waste material, such as galvanizer's dross, will, of course, remain in this country for smelting and will eke out the domestic supply

It is scarcely time yet to see how the smelters will work out of the slough of absurdly narrow margin that for a long time has been destructive of profit. As for the miners the new tariff went into effect along with a natural revival of good business in this country and moreover with very favorable conditions in Europe, where spelter is the brightest feature of the metal market, and they can make hay while the sun shines. The chances are that the price for spelter in our markets will go still higher as there remains a margin before the import point will be reached and the demand from galvanizers and brass-makers is strong. The extra price that they have to pay is, of course, passed on to the ultimate consumer.

Commendable Publicity

When the members of the American Institute of Mining Engineers visited the plant of the Boston Consolidated Mining Company near Salt Lake City on Oct. 8, the management of that company distributed a pamphlet giving full technical data about the mines and mills, cost of operation, etc., summary of which is published elsewhere in this issue of the JOURNAL. These data cannot fail to be of interest to all engineers.

The policy of a corporation which does not hesitate to take the public into its confidence is highly commendable, and the frankness on the part of the management of the Boston Consolidated should afford satisfaction to the holders of securities of that company, because it is the best possible evidence that the management is not afraid of intelligent criticism. The data that are given enable any shareholder to see for himself what is being done and thereby inspire his confidence. The Boston Consolidated has always rendered full and satisfactory reports even when its directors have been obliged to admit errors of judgment.

"What's in a name?" is an old question asked ironically. Some years ago when some of the zinc smelters consolidated, the consumers who used to appreciate and admire the "Choctaw" brand (we use imaginary names), were quite dissatisfied with the same spelter when branded "Silver Star." The mere shifting of a certain number of cast-iron molds from one works to another rectified all complaints. In Great Britain, now, English tin is said to be a drug on the market, for the simple reason that the grade so-called is produced from ever-increasing importation of foreign ores mixed with the Cornish production in ever-decreasing proportion.

Whether Doctor Cook did or did not precede Commander Peary to the North Pole is a controversy that we have no intention to enter. But anyway it seems certain that the polar region is an unfathomed sea and, therefore, are dispelled our hopes of a new continent with mineral resources to exploit. If only there had been land at the pole and indications of gold, we could have trusted the prospectors to get there without making much ado about it. But now comes W. J. Bower, an Arctic explorer, with a story of immense copper deposits in Prince Albert Land (far, far north), and the South Pole still remains.

The rise in the price of Ely Central on the New York curb to $2.50 will relieve the minds of some engineers who bought this stock at the time of its original promotion, three or four years ago, and since then have been holding it as a "dead one." Undoubtedly they will now take advantage of the unexpected market.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Applying for a Position

The accompanying advertisement in a London journal started a train of thought which resulted in these notes. Judging from some applications which I have examined the following should be of value to at least a few readers of the JOURNAL.

APPLICATIONS FOR APPOINTMENTS

Expert advice without onerous conditions.
Highest credentials.
All communications treated in strictest confidence.
Abundant testimony to helpfulness of ideas from all classes of professional clients.
Applications furnished ready for signature.
Advertisements drafted in pulling form.

The problem of attracting the attention of the officer who has the selection of the incumbent for the position sought is deserving of more attention than is usually given it. Ability to write attractively to this end seems to have attained the dignity of a means of livelihood. A recent application, written with pencil on a postcard reads as follows: "I am an experienced, practical mill-man and want a job." This man apparently knows his own worth, but upon what could a prospective employer base a judgment?

Many men secure positions by application in person, and such is a good method when feasible. But take as an example a cyanide shiftman accustomed to a salary of $200 per month. Let us say he is out of a position and wants to lose no time in getting a new place. On the personal application system his funds might not suffice to place his merits and claims before 20 superintendents. By doing as I propose in this communication, he can reach hundreds of plant operators.

First, get a list of such operators. Back files of the prominent technical journals if carefully scanned, will afford a large, live, valuable list which can be abstracted from the news items and professional cards. The applicant should then carefully prepare a sectionalized history of his employments, their lengths, the names of the companies and superintendents and (if advisable) his reasons for leaving. Use "gray matter" in preparing this little autobiography and cover everything which will help. Be concise, yet not too brief. After it has been written and rewritten, condensed in some places and elaborated in others, it should preferably be set up in type and printed. If not printed it should be at least most carefully typewritten.

A letter (most emphatically not a circular letter) should then be written to each prospective employer, calling special attention in each case to points in the record which would seem to be of greatest interest. Where possible, reference to probable mutual acquaintances is often of service. The letter may close with an offer of copies of testimonials, a request for the privilege of competing for any position which may be vacant and finally a graceful admission of the apparently unavoidable egotism of the letter. If the list includes numerous short engagements it is well to lay stress in the letter upon the varied and therefore valuable experience attained. If the engagements have been few in number, boast quietly of the steadiness and "stick-at-it-ness" demonstrated.

The manufacturer of mining machinery, the manager of the mine, the consulting engineer, all have files for just such applications. Could one see such a file, he would realize the value of these hints. Each application creates its own impression and the idea back of the application should be to give all desired information in the most attractive way. While American managers depend little upon written testimonials, Englishmen, Germans and other Europeans value them highly. If one bears in mind that a recommendation from each employer, either verbal or written, may be needed at some future period, such a thought will greatly influence one's conduct when about to surrender a position, even though relations are strained.

Of course, none of the above applies to the recently graduated mining student. He does not seek a position—is really unfortunate if he obtains one. What he needs is a series of jobs, a few months under ground, in the mill, in the smeltery, in the laboratory, shifting from one camp to another until he learns something. To secure such jobs, all that is needed is a suit of partly worn overalls (not merely old clothes or even new overalls) together with the ability to keep his soft hands out of sight as he asks the foreman, "What's the chance for a job?"

STANLEY S. ROBERTS.

Chicago, Ill., Oct. 12, 1909.

Spurious Potassium Cyanide

Certain information consequent upon a persistent hunt for trouble in the cyanide department of the Daly Reduction Company, Ltd., of Hedley, B. C., would seem to reduce to an absurdity the famous and worldwide controversy between metallurgists as to the comparative merits of KCN and NaCN in the treatment of gold ores. What follows is offered for consideration as to its commercial importance only.

The present management of the above company entered into its metallurgical problems with a distinct prejudice in favor of KCN. However, the works had been using NaCN and there was a large stock thereof on hand. Moreover, the retiring management had claimed to have found the proper solvent for these ores so that a series of tests was made which resulted in the employment of KCN thenceforth, with equally satisfactory results and with an important and satisfactory reduction in costs. Yet here, as elsewhere, there remained much that was unsatisfactory to the metallurgist in the way of extraction and, particularly, in the values of the zinc-box tails. Therefore, a vigilant hunt for the mysterious cause of irregularity was kept up but until recently no suspicion rested upon the honesty of the KCN itself.

In May, 1909, the zinc tails were running much too high and certain extraction percentages were too low. A new shipment of KCN arrived and, being the nearest at hand in the warehouse, was sent to the mill. The effect was immediate, tails dropping and percentages rising. The old and the new lots were then alternated without the knowledge of the cyanide men and the invariable results obtained seemed to point conclusively to a difference in the KCN.

RESULTS OF INVESTIGATION

Analyses were started, a protest was lodged with the importer and the real puzzle began. Samples of both lots were sent as controls to a well-known public analyst, the old lot marked No. 1 and the new No. 2. They ran as follows: No. 1—KCN, 15.83 per cent.; NaCN, 82.24; SO_3, 0.13; total, 98.20. No. 2—KCN, 15.68 per cent.; NaCN, 82.35; SO_3, 0.17; total, 98.20. In view of these identical results and because investigation is still in progress, no attempt at any explanation will be made here but the following queries are propounded instead: (1) When KCN is ordered and paid for at market rates, why is 82 per cent. NaCN shipped? (2) If a weighed portion of this mixed salt, titrated with solution standardized for KCN, shows a value of 100 per cent. KCN then what sort of a mixture is it? Why not over 100 per cent. KCN? (3) If 4.53 cents less per pound is paid for this mixed salt with 82 per cent. NaCN than for 100 per cent. NaCN, is not the user the gainer? (4) But if the user wishes the stronger base, KCN, then is he not a loser? (5) And if he wishes NaCN, is

he not a loser at the higher price for this salt?

As far as we know, most metallurgists have assumed with us that a salt bought of reputable dealers as potassium cyanide, marked and billed and paid for as 98-99 per cent. KCN, actually was potassium cyanide of that standard. But it will now be noted that the usual certificates of purity furnished with each shipment are equivocal. Nor is this all that our inquiries have developed. We are advised that the so-called cyanide trust, operating in the United States under a selling agreement, has for years put out a mixture of KCN and NaCN; that there is very little of the pure, or commercial, KCN in the market. Almost all that is sold as KCN is mixed with 8 to 40 per cent. NaCN or more, as is evident in our case.

Again, the chemists in the appraisers department of the U. S. Custom House appear to have been the first to discover this adulteration and they now assay every lot imported. The reason for this adulteration is obvious. In the first place, NaCN is much cheaper to make than KCN, which requires the use of kali salts from Stassfurt, Germany, while the sodium is readily obtained from rocksalt or seasalt. Besides, the United States tariff imposes a higher duty on NaCN than on KCN.

Considering the difficulty of a sodium and potassium quantitative analysis it is not so surprising that metallurgists should have overlooked what the Government chemists have long known. The only surprising thing about the whole question is, perhaps, that anyone should take anything for granted, especially when that anything is a manufactured article. F. A. Ross.

Manager, Daly Reduction Company, Ltd.
Hedley, B. S., Sept. 27, 1909.

Electrical Wiring for Deep Mining Work

I read with great interest the account of the fixing of the power cables in the shaft at one of the Calumet & Hecla company's mines, as described in the JOURNAL of Sept. 11, 1909. The arrangement appears to me to have been carefully thought out, and carefully carried out, as shown by the fact that the wires were good after being in position about 13 years. I notice that three separate wires were used for three-phase work, the close proximity necessary with wires carried in a pipe, and the twisting that takes place, when one wire is drawn in after the other, being quite sufficient to neutralize the induction. I think that the engineer exercised discretion in adopting this plan. One of the greatest difficulties the electrical engineer has to deal with, when providing cables for use in mines, and particularly for fixing in shafts, is the great weight, and usually the want of flexibility of the cable in consequence.

The common plan adopted in the United Kingdom is to have the three wires laid up into one cable and armored outside. With small wires, providing for a small amount of power, this arrangement answers very well. It makes a compact cable. But, where a large amount of power has to be provided, and therefore the cable has to be large, to my mind it is wiser to handle each of the wires separately. As arranged, of course, the individual cables would not be armored, the inclosing pipe answering all the purpose of the armor where the three wires are stranded together.

I note also that india-rubber insulation was employed. Good work has been done in mines in the United Kingdom with bitumen and paper insulation, but I much prefer rubber, and plenty of it. One of the troubles in connection with rubber insulation is the difficulty of insuring that one is getting good rubber. A few years ago West African rubber, which had been put upon the market in fairly large quantities, and which was worth about one-fifth the value of Brazilian rubber, was largely used by some firms, and there was nothing to show when the cable was made up, what quality of rubber had been employed. The protection is of course the old one—buy from a good firm which will not play tricks of this kind, and I observe that this was done by the Calumet & Hecla company. In too many instances in the United Kingdom, clerks who have the ordering of stores, have been allowed to buy cheap cables, under the impression that they were saving their company money, when in reality they were wasting many times the amount they apparently saved. Good rubber is expensive, but it is by far the cheapest in the long run, as the experience at the Calumet & Hecla shows.

I think also that the experience at Calumet & Hecla shows how much may be done in the matter of insulation, by the use of pure rubber tape. The experience there confirms my own in coal mines in the United Kingdom. I note that the connecting pieces were insulated with numerous layers of pure rubber tape, and that the insulation lasted. A good many years ago I had a troublesome case in a mine shaft, where there was a large quantity of water, and where we were obliged to joint in the shaft. I covered the joint with a number of layers of pure rubber tape, putting the tape on with considerable tension, and carrying it back well beyond the joint on each side, covering the rubber tape with two or three layers of primed tape. I was exceedingly anxious about these joints, but they stood well, and when I opened some of them a long time afterward, I found them quite good, the water not having penetrated through them.

The method of supporting the cables in the shaft strikes me as being remarkably good. It will be noticed from the description given in the article, that the individual cables were quite loose in the pipes, but were held by what Mr. Fichtel calls anchor blocks, at intervals of 100 yd. On this side we call them cleats. I observe that they were 12 in. long, and that the grooves were slightly tapered, leading the ends of the cables into the next pipe. My own preference is for grooved boarding right through the length of the shaft, the boarding having been prepared either by creosoting or by one of the other methods of preserving timber. I like to have the grooves slightly smaller than the cables they are to hold, and I observe that this method was followed with the anchor blocks. Cables are then tapped gently into the grooves, the cover put on, and the cables are supported throughout the whole of their length. The method adopted at Calumet & Hecla evidently gave the equivalent of this, as they would be supported to a certain extent between the pipes on the anchor boxes, and firmly supported on the anchor boxes themselves. One objection that has always been raised to my method of employing groove boarding, is the great expense. Unless the boarding is rendered waterproof, the method is bad, because the porous wood holds the water, and delivers it to the cables, which it is clasping, all the way down, and there is the best chance of some trifling weakness in the cable being discovered. The pipe system adopted by the Calumet & Hecla Company would cost more I think, than the grooved boarding, but it has the distinct advantage that the pipes protect the cables very much better than boarding, particularly in the shafts of metalliferous mines, and the anchor boxes and station-connecting boxes gave full facilities for examining the cables at frequent intervals.

The pipes appear to have been carefully prepared, by drawing chains through them, to get rid of any burs that might be present, and the whole thing to my mind appears to have been designed and executed in a practical and scientific manner.

SYDNEY F. WALKER.

Bloomfield Crescent,
Bath, Eng., Sept. 24, 1909.

According to the U. S. Geological Survey, the production of sapphire in the United States in 1908 was of an estimated value of $58,397, as against $229,800 in 1907. The greater part of the 1908 output came from a single mine in Fergus county, Mont., but a small quantity was obtained in Morgan county, Mo.

The exportation of tin from Malaya in the first six months of 1909 was 385,211 pikuls, against 414,084 pikuls in the first six months of 1908.

Details of Practical Mining

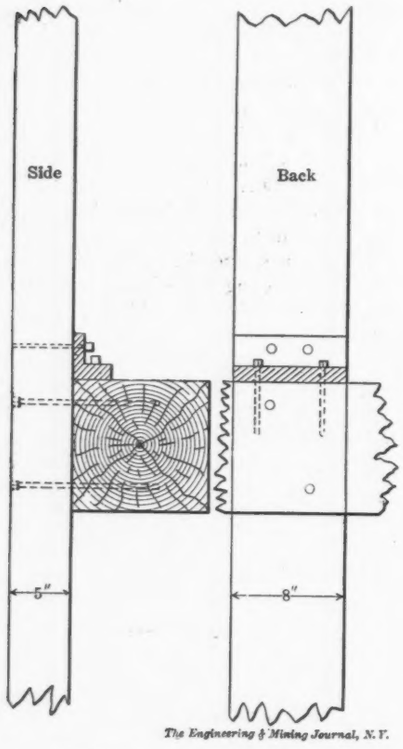
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Supporting Guides or Runners in Shaft

The scheme shown in the accompanying illustration for the support of shaft guides is used at the Tobin and Dunn mines at Crystal Falls, Mich. The guide itself is 5x8 in., and is fastened to the shaft timbers by two ¾-in. lag screws. In addition to this a 3x3-in. angle iron is used every 10 or 15 ft. in the shaft. This angle iron is bolted to the runner with two ½x6-in. bolts and fastened to the shaft timber with two ½-in. lag screws. The original method was to use only one lag screw in the center of a 5x6-in. runner. This was found to be entirely too weak, and the screws almost invariably broke at a point where the thread begins. With the present arrangement the runners do not work loose, except as the acid waters may corrode the bolts.



METHOD OF SUPPORTING GUIDES

Gates for Ore Chutes Used in the Iron Mines of Michigan and Minnesota

Four types of gates are used in the iron-mining districts of Minnesota and Michigan, each of which is shown in the accompanying illustrations. Fig. 1 is used almost exclusively in the Mesabi district. It is 30 in. wide, made of ½-in. sheet steel bent to the arc of a circle. It is operated by a lever attached to a 1½-in. square bar, shown in the upper part of Fig. 1.

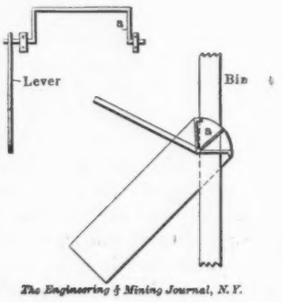


FIG. 1. TYPE OF GATE USED IN THE MESABI DISTRICT, MINNESOTA

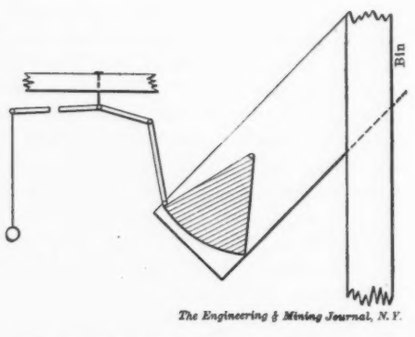


FIG. 2. ORE GATE USED AT THE PIONEER FURNACE

Fig. 2 is used at the Pioneer furnace, Marquette, Mich. It is 3 ft. by 18 in. and is 24 in. from the pivot to the face of the gate. It closes easily and works well with fine ore. Fig. 3 is used at Iron Mountain, at both the Oliver and Pewabic mines. This one has the advantage in that it is in the bottom of the chute and closes from the bottom. As soon as the edge of the gate rises the least amount it forms an obstacle for the ore and the ore thus blocked assists in holding the remainder in check. It operates easily and without any trouble whatever. It has been used in this district for many years.

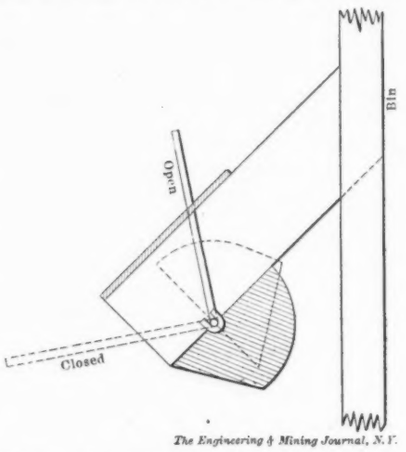


FIG. 3. GATE USED BY THE OLIVER AND PEWABIC COMPANIES, IRON MOUNTAIN, MICH.

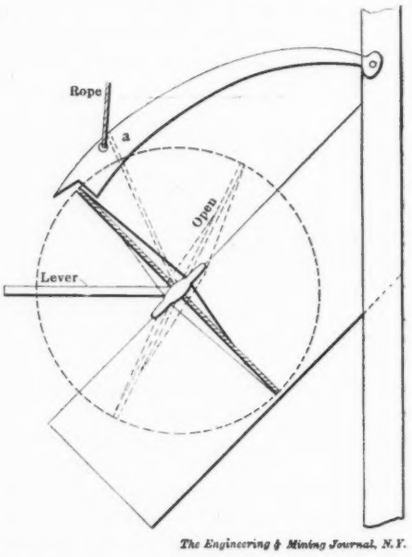


FIG. 4. GATE USED AT THE TRADERS' MINE, IRON MOUNTAIN, MICH.

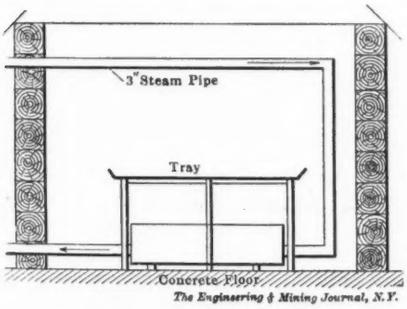
Fig. 4 is a gate which is used at the Traders' mine. It consists simply of a sheet of ½-in. plate steel 30 in. wide by

48 in. long. Across the center is placed a bar 1¼ in. square, which is used as an axle upon which it revolves. To this is attached a crank or lever by which it is possible to revolve the gate. The gate is held in place by a catch *a*. When it is desired to draw ore, the catch is lifted by a rope, and the bottom of the door swings out. In order to shut the gate, the crank is turned until the top end of the gate engages the ore when the weight of the ore closes it. Another gate similar to this is used in the Crystal Falls district. This gate is only one-half as long, and each time it is opened, it makes one complete revolution instead of one-half, as shown in Fig. 4.

A gate that is used for coarse lump ore is made of finger bars, about 2 in. square, which slide up and down through slots. The top of the bar is attached to 4 ft. of chain, and connected with an axle and crank. As the crank is turned the chain winds up and lifts the fingers. Sometimes these are operated by an air lift. Each bar is independent as it drops and a hard lump will likely not interfere with more than one bar at a time. The bars for this purpose should be about 6 ft. long, and have a 2-ft. lift. Eight or ten bars will be enough for any ordinary gate.

A Powder Thawer Used at the Traders' Mine

At the Traders' mine, Iron Mountain, Mich., a small house has been constructed in which to thaw all the powder used in the mine. The building is 10x12 ft., built of 12x12-in. timbers placed close together and is on a low piece of ground sheltered by a high bank. Exhaust steam from the boiler house is used for heating the building. It enters through a 3-in. pipe above the tray upon which the powder is placed, and then passes down and into a cylinder 12 in. in diameter and 5 ft. long which is beneath the tray. The tray itself is made of ½-in. iron bars placed about ½ in. apart. It is 3x6 ft. and affords ample room for four or five boxes of powder. This has been in use 14 years. Only one day's supply of powder is kept in this building. The fuse and caps are in another building 50 ft. away. The main powder storage house, where carload shipments are kept; is ¼ mile distant.



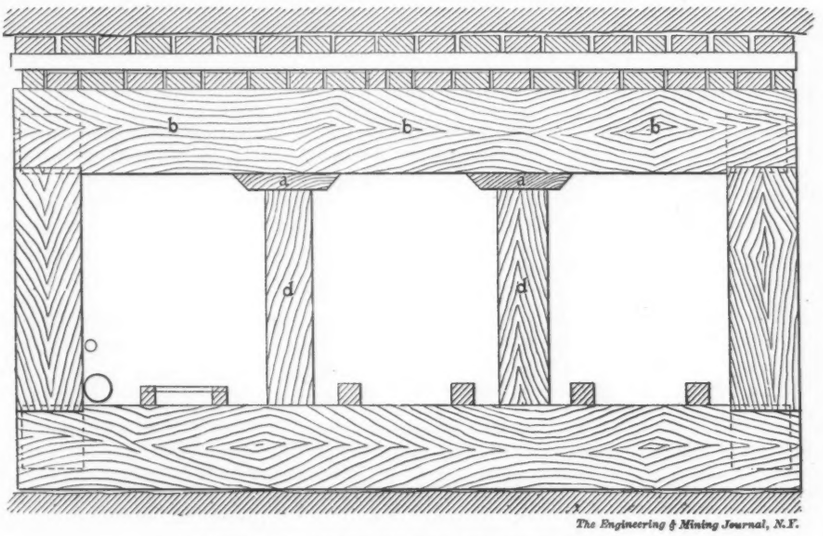
POWDER HOUSE AT TRADERS' MINE

Shaft Timbering at the Keystone Mine

By William H. Storms*

The Keystone mine at Amador City, Cal., is one of the largest mines on the famous Mother Lode. It has been extensively developed by a number of incline shafts of varying depth, the deepest being the Patton shaft near the north end of the property, which was started by W. H. Patton over 40 years ago, and now has a depth of 1573 ft. This shaft, beginning in the slate country rock, at a depth of about 400 ft., is approached by a fissure which occurs in the hanging-wall side of the shaft and continues in or near it down to about the 800-ft. level. The ground is very heavy, and has for years been a source of annoyance and expense in keeping the shaft open. Time and again the timbers have been reinforced and renewed until, in some of the worst places the shaft is supported by a solid crib work of great timbers. One effect of the heavy downward pressure of the swelling ground on the hanging-wall side of the shaft has been to force the caps down upon the ends of the dividers, causing the latter to cut deeply into the caps, thereby weakening the timbers and reducing the size of the shaft, hence necessitating frequent repairs.

A few months ago a scheme was introduced in the retimbering of the Patton shaft which has been found to give complete satisfaction and which is evidently going to result in the saving of much time and timber in repairing this shaft. The idea is illustrated in the accompanying sketch. It is simply the insertion of a heavy head block *a* between plate *b* and divider *d*, as shown. No mortise or dap is cut in the wall plate, and the divider is sawed off square. The plate timbers are 18 in. square, the dividers 12x18 in., and the head block is 18 in. wide, 24 in. long and 4 in. thick. It is cut as shown, and is slipped in between the wall plate and the top of the divider and held in place by driving in shingle wedges. The pressure soon exerts itself, however, and wedges then become superfluous.



METHOD OF TIMBERING THE KEYSTONE SHAFT

*Mining engineer, Sutter Creek, Cal.

Uses for Old Cables

At the Chapin mine an old 5-in. flat cable is now being used as a tail-rope balance in the Ludington shaft. The cable with which the skips are hoisted vibrated considerably, and the old cable was attached to the bottom of each skip and they are now run in balance. This stops a large amount of the vibration. The scheme is used in hoisting from the 14th level.

Another use for round cables is for fences around offices, or places where it is desired to have something in the artistic line. This is now being done by the Corrigan & McKinney Company around its general office at the Great Western mine. Cast-iron posts were especially designed with three holes in them 16 in. apart, just large enough for the cable to pass through. These posts are set in concrete blocks and in this way make a very substantial and neat fence. The cable is much better than ordinary gas pipe, inasmuch as it is flexible and does not get out of shape. Again, the twist adds to its beauty. Another company uses a large amount of old cable for reinforcing concrete.

New Publications

DIE WARMETECHNICK DES SIEMENS-MARTINOFENS. Von Dr. Ing. F. Mayer. Pp. 123, illustrated, 6½x9¾ in., paper, M.5.40. Halle, a.d.C., 1909: Wilhelm Knapp.

A STUDY OF THE OPEN HEARTH FURNACE AND THE MANUFACTURE OF OPEN HEARTH STEEL. Pp. 91, illustrated, 4¼x6¾ in., leather. Pittsburg, 1909: Harbison-Walker Refractories Company.

REPORT ON THE CHROME IRON ORE DEPOSITS IN THE EASTERN TOWNSHIPS, PROVINCE OF QUEBEC. By Fritz Cirkel. Pp. 141, illustrated, 6½x10 in., paper. Ottawa, 1909: Government Printing Bureau.

GEOLOGIA, INDUSTRIA MINERAL, CLIMA, VEGETACAO, SOLO AGRICOLA, INDUSTRIA PASTORIL. Por Miguel Arrojado Ribeiro Lisboa. Pp. 172, illustrated, 7½x10½ in., paper. Rio de Janeiro, 1909: De Rodrigues & Co.

DIE ELEKTROCHEMISCHEN VERFAHREN DER CHEMISCHEN GROSS-INDUSTRIE. By Dr. Jean Billiter. Mit 117 Figuren und vielen Tabellen im Text. Pp. 284, illustrated 6½x9½ in., paper, M. 12. Halle a. d.S., 1909: Wilhelm Knapp.

GEOLOGY OF THE DISSEMINATED LEAD DEPOSITS OF ST. FRANCOIS AND WASHINGTON COUNTIES. Vol. IX, Part I and II. By Ernest Robertson Buckley. Pp. 259 + 82 plates. Jefferson City, Mo., 1909: Missouri Bureau of Geology and Mines.

JAHRBUCH DER ELEKTROCHEMIE UND ANGEWANDTEN PHYSIKALISCHEN CHEMIE. XII Jahrgang. Berichte uber die Fortschritte des Jahres 1905. Pp. 1049, illustrated, 6½x9¾ in., paper, M. 30. Halle a. d. S., 1909: Wilhelm Knapp.

STRENGTH OF MATERIAL: AN ELEMENTARY STUDY PREPARED FOR THE USE OF MIDSHIPMEN AT THE U. S. NAVAL ACADEMY. Second Edition, Revised. By H. E. Smith. Pp. 170, illustrated, 5x7½ in., cloth. New York, 1909: John Wiley & Sons.

TRANSACTIONS OF THE INSTITUTION OF MINING AND METALLURGY. Eighteenth Session—1908-1909, Volume XVIII. Edited by Arthur C. Claudet, S. H. Cox, Wm. Gowland and C. McDermid. Pp. 517, illustrated, 5½x8½ in., paper. London, 1909: E. & F. N. Spon and The Institution of Mining and Metallurgy: New York, 1909.

ANNUAL REPORT OF THE UNDER SECRETARY FOR MINES, INCLUDING THE REPORTS OF THE WARDENS, INSPECTORS OF MINES, DEPARTMENT GEOLOGISTS, AND OTHER REPORTS FOR THE YEAR 1909. Pp. 175, illustrated, 8½x13 in., paper. Brisbane, 1909: A. J. Cumming, Government Printer.

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1908. Part I, Metals and Non-metals, except Fuels. U. S. Geological Survey, Bulletin No. 380. By C. W. Hayes and Waldemar Lindegren. Washington, 1909: Government Print- Pp. 406, illustrated, 6x9 in., paper. Government Printing Office.

THE RECOGNITION OF MINERALS: BEING A COLLECTION OF NOTES AND SIMPLE TESTS FOR THE USE OF TRAVELLERS AND PROSPECTORS. By C. G. Moor. MONOGRAPHS ON GEOLOGY, ORE DEPOSITS, ETC. By Donald A. MacAlister. Pp. 247, 5½x8½ in., cloth, 7s. 6d. London, 1909: THE MINING JOURNAL.

KUTTER'S FORMULA. By L. I. Hewes and J. W. Roe, Sheffield Scientific School, Yale University, New Haven, Conn. 14x14 in., printed on cloth-backed paper, 50c. New York, 1909: American Institute of Mining Engineers.

A graphic solution of Kutter's formula for the flow of water has been worked out by Dr. L. I. Hewes, which may be of interest to those who deal with canals, flumes and streams. The formula itself is extremely cumbersome, and the purpose of this chart is to furnish a rapid solution, sufficiently accurate to be within the limits of the observed data.

SUMMARY REPORT OF THE MINES BRANCH OF THE CANADIAN DEPARTMENT OF MINES FOR THE NINE MONTHS ENDING DEC. 31, 1908. Pp. 96; 6½x9½ in. Paper. Ottawa, 1909: Government Printing Office.

This report covers a period of nine months, instead of a year, owing to a change adopted by the department under which the summary branches will henceforth be issued simultaneously at the close of the calendar year. The contents include a review by Director Eugene Haanel of the work undertaken by the the branch, comprising an investigation by him of electric smelting in Sweden and producer-gas plants in Germany; the establishment of an experimental peat-fuel plant at Ottawa now under construction; the testing of coals and lignites at McGill University, Montreal, and the operations of the chemical laboratories and the Vancouver assay office. The general fieldwork covered an extensive area, among its more important features being the investigation of iron-ore dposits in Nova Scotia, New Brunswick and Ontario; examinations into the occurrence of tungsten ores and the gypsum deposits of the Maritime provinces, and additional work in the asbestos region of Quebec. Dr. R. W. Ells furnishes a preliminary report on tests made in Scotland of New Brunswick oil shale, the results of which were satisfactory, the yield of crude oil and sulphate of ammonia exceeding most of the Scotch shales. The report of J. McLeish, chief of the Division of Mineral Resources and Statistics, calls attention to the greatly increased volume of work imposed on the division by the additional duties assigned it and the reductions in its staff; also to the difficulties in the way of a satisfactory presentation of mining statistics. Some of these are caused by the differences in the methods of collecting statistics pursued by the different provinces, especially as regards the valuation of the production. Owing to the want of a uniform basis there is often an apparent discrepancy between the Dominion and the provincial statistics.

INDEX OF MINING ENGINEERING LITERATURE. By W. R. Crane. Pp. 803, 6x9 in., cloth, First Edition, $5. New York, 1909: John Wiley & Sons.

Contents: Accidents in Mining. Animals in Mines. Blasting in Mines: Methods and Conditions. Chemistry: Methods and Practice. Compressed Air in Mining. Clays and Their Uses. Concentration. Concrete, Mortars and Plasters. Conveyers for Minerals and Coal. Dams for Mining Purposes. Mining Districts. Mine Drainage. Drilling and Boring. The Industrial Development of Mining and Production. Dumping Devices. Technical Education. Explosives for Mining Purposes. Fuels: Coal, Coke, Gas, Oil, etc., and Fuel Testing. Geology: Mineral and Fossil Fuel Deposits. Handling and Storage of Mineral. Haulage in Mining. Hoisting in Mining. Labor in Mines. Ladders in Mines. Life in Mines. Management of Mines. Maps. Metallurgical Methods and Processes. Metal Minerals. Mine and Mill Constructions. Mine Gases. Mining Law. Mine Lighting. Mining. Mine and Mill Machinery. Mine Support. Photography for Mines and Technical Work. Power: Steam, Water Electricity and Gas. Reduction. Hopes for Mine Use. Sampling of Mines. Sizing of Mineral. Signaling in Mines. Surveying. Transportation. Tunneling. Mine Ventilation. Water.

IGNEOUS ROCKS. Volume I, $5. By Joseph P. Iddings. Pp. 464 6x9 in.; cloth, New York, 1909: John Wiley & Sons.

Contents: Chemical and mineral composition and constitution of igneous rock. Chemical composition of the pyrogenetic minerals. Principles of physics and chemistry applicable to rock magmas. Chemical reactions in rock magmas. Crystallization and texture of igneous rocks. Separation of substances from solution. Differentiation of rock magmas. Modes of occurrence of igneous rocks. Nomenclature and classification of igneous rocks.

This first of the two volumes of Professor Iddings' treatise is for many reasons welcome to students, post-graduates and field workers in geology. No other department of that science has waited so

long for clear analysis and classification. We can all remember the time when such comprehensive terms as "trap" covered the ignorance, not only of practical explorers, but also of scientific observers; and we can remember still more clearly the period during which the differentiation of igneous rock species gave rise to a multitude of separate names, the ambitious employment of which by unskilled local observers, and even by practical miners and prospectors, well nigh destroyed the value of their testimony as first-hand observers. Such a stage of excessive emphasis upon specific differences always precedes in science the simplification based upon resemblances and common features of character or origin. The geology, lithology, genesis and age of the igneous rocks had been brought by the researches of many keen observers into a manifold confusion of this kind, when a few leading investigators undertook to bring order out of the pregnant chaos. Of these Professor Iddings is admittedly in the front rank; and this treatise from his hand is a timely and much needed aid to both students and practitioner. The work is to comprise two volumes, of which the first, now before me, treats of the composition, texture and classification, while the second will be devoted to the description and local occurrences of the igneous rocks.

The terms "genesis" and "origin" do not appear in any titles or subtitles; but the subject itself receives much illumination in the chapters of this volume, though the author apparently avoids the promulgation of any genetic theory. The reason may lie in his disinclination to discuss the source of the heat of rock fusion. This omission is, on the whole, advantageous, as leaving him free to fill his available space with material less speculative and more useful. Even those who would build genetic hypotheses must use the facts here carefully stated and arranged.

Another advantageous omission is that of the ordinary rudiments of descriptive geology. The author assumes on the part of the student such an elementary acquaintance with rocks as may be acquired from standard general textbooks or courses of college instruction, and thus saves room for his special subject, unencumbered by a rudimentary introduction, not complete enough for thorough instruction, and not needed by those who are competent to appreciate the rest of the book.

In the matter of classification, Professor Iddings recognizes the principle already established in other departments of science—for instance in that of ore deposits—that no one general classification will serve conveniently at once all uses and purposes. The economic geologist, like the practical miner, and the intelligent but non-expert traveling observer, will always use for the first record, at least, a classification not dependent upon the subtle distinctions of the microscope or the chemical laboratory. Indeed, it is well that this is the case. Nothing is more annoying or, sometimes, more misleading, than the loose employment by the ignorant of modern terms, picked up from the treatises of specialists. Nevertheless, scientific investigation requires scientific nomenclature; and in this book Professor Iddings, without superseding accepted nomenclatures, bases his discussion of the igneous rocks upon their chemical composition, which he declares to be their most fundamental and essential character, an assertion which may be granted with the addition of the qualifying phrase, "for the purpose of such a study of them as is here contemplated." It is conceivable that, from some other standpoint, the physical characters, or the age, or the position, or the dynamic history, of igneous rocks might be a more important feature.

Before reaching in Part II the questions of nomenclature and classification, the author discusses in Part I the chemical composition of igneous rocks and of the pyrogenetic minerals found in them; the principles of physics and chemistry applicable to rock magmas (including the kinetic theory of gases, liquids and solids, the facts and laws of fusion, polymorphism, solution in liquids and solids, and chemical reactions in solutions); the chemical reactions in rock magmas; the separation of substances from solution; the crystallization and texture of igneous rocks (an admirable chapter, explaining crystallinity and granularity, and the effects of viscosity, dissolved gases, rate of cooling, molecular concentration, etc., as well as the shapes assumed by specific minerals, the arrangement of crystals and other features of homogeneous and heterogeneous textures); the differentiation of rock magmas and its results, and the modes of occurrences (extrusive, intrusive and structural) of igneous rocks.

This brings us back to nomenclature and classification, under which head we have, in Part II, three chapters. The first is a historical sketch, of intense interest and great value, in which the work of Haidinger, Werner, Brongniart, Cordier, Leonhard, De la Beche, Bunsen, Scheerer, Rose, Roth, Bischof, Naumann, Cotter and others is recognized and critically weighed. Most of these authors, however, did comparatively little for the igneous rocks. An exception was Roth, whose classification (1861) is here published in full. The publications of Zirkel (1866) and Richthofen (1868) are recognized as laying the foundation of modern petrography, and Zirkel's work (1873), together with the first volume of Rosenbusch (1873) and his second volume, on the igneous rocks (1877), are cited as classics with respect to microscopic investigation. The controversies which followed these publications are critically summarized; but the author adheres in the main to the qualitative mineralogical classification which they proposed.

In Chapter II of this part, we have this qualitative classification, based on predominant minerals, and comprising rocks (1) consisting chiefly of quartz; (2) characterized by quartz and feldspar; (3) characterized by feldspar; (4) characterized by feldspar and feldspathoids; and (5) characterized by feldspathoids.

But the most important classification is the quantitative one set forth in the final chapter. This is the system proposed by Cross, Iddings, Pirsson and Washington, and set forth in the *Journal of Geology*, Vol. X (1902), pp. 555-690, and in "Quantitative Classification of Igneous Rocks," published in 1903 by the University of Chicago press. It is, as Mr. Iddings says, "a quantitative chemico-mineralogical classification;" that is to say, it is based, not on a quantitative determination of the elementary rock constituents alone, but on the chemical composition stated in terms of the standard minerals, in which it is to be regarded as expressed. The system has a nomenclature of its own; and any exposition of it here would require far more space than is available. Indeed, I do not see how it could be adequately set forth in less than the 60 pages which Professor Iddings gives to it. These pages, however, with the illustrative tables, seem to me to present a statement sufficient to enable a competent student both to comprehend and to employ the system. I will only add, concerning it, these general observations:

It is admittedly in some respects arbitrary and artificial, yet it seems to approach more nearly, on the whole, to the character of a practicable formula for the interpretation of nature than any other yet propounded. It is self-consistent and logical, as well as ingenious; it constitutes a step in advance, taken by a group of competent American investigators, thoroughly acquainted with what had been done before in the same field, at home or abroad; and it reflects, as such, the highest credit upon its associated authors. Whether it will ultimately win a general acceptance will depend, in my humble judgment, upon the degree in which it shall prove useful as a tool for investigation and a key to generalization in its field. Meanwhile, I do not think any student in that field can afford to be ignorant of its principles, and the arguments by which they are supported.

This volume is published in excellent typographical style, and with satisfactory illustrations and tables. I notice some trivial errors, indicating an ignorance of the German language on the part of the proofreader. Thus, on page 296, the German equivalent of (lava) "streams" is given as "stromen," whereas it should be "ströme;" and on page 309 the German equivalent for "dikes and veins" is given as "gangen," whereas it should be "gänge."

R. W. RAYMOND.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Victor M. Braschi, of the City of Mexico, is in New York.

John B. Farish leaves this week for Mexico on professional business.

Arthur L. Pearse sailed from London, Oct. 6, for an inspection tour in the United States.

Alexander Sharp, of Orient, Wash., has been examining coal lands in Alberta, Canada.

E. G. Woodford sailed for London last week. From there he plans to go to Venezuela.

Edwin J. Collins, of Duluth, Minn., is examining some copper mines near Globe, Ariz., for clients.

Prof. Willet G. Miller, provincial geologist of Ontario, is examining the Gowganda silver district.

J. R. Finlay has gone to the West on professional business, intending to be absent about six weeks.

E. A. Shannon, of Detroit, Mich., has been elected secretary of El Triuñfo Mining Company of Mexico.

S. M. Stone, manager of the Butters plant at Virginia City, Nev., has returned there from a trip to the East.

F. A. Thomson, professor of mining engineering at the State College, Pullman, Wash., was at Butte, Mont., recently.

R. B. Lamb, of the C. L. Constant Company, New York, is leaving on a prolonged professional tour of the Western mining sections.

Herbert C. Enos, of Johnson & Enos, mining engineers, of the City of Mexico, is making a trip through the State of Guerrero, Mexico.

O. B. Perry has returned from Yukon Territory, where he has been directing the placer gold-mining operations of the Yukon Gold Company.

C. L. Constant, Jr., of the C. L. Constant Company, New York, is making an extended professional visit to the mining sections of Ontario.

John Markle, of Philadelphia, well known as an anthracite operator, has recovered his sight, temporarily lost, under the care of a German physician.

A. B. Hodges, of Grand Forks, B. C., manager of the Granby Consolidated Mining, Smelting and Power Company, has been in New York on business.

Frederic Keffer, of Greenwood, B. C., engineer and geologist for the British Columbia Copper Company, lately paid a visit to the Exposition at Seattle.

F. B. Hyder has resigned as superintendent of the Dawson Mining Company, near Nacozari, Mexico. Dr. O. B. Dawson, of El Paso, has taken charge of the mines.

Professor Newsom, of Stanford University, Cal., has returned from the Canadian Yukon, where he has been doing professional work on some Klondike claims.

Albert L. Waters, of Los Angeles, Cal., who left Mexico in August because of illness, has been in Tucson, Ariz., recently and is now in Denver on professional business.

Ex-Governor Mackintosh, of British Columbia, has been examing the Cobalt, Gowganda and Elk Lake silver areas with the object of preparing a report on smelter facilities.

R. H. Chapman, of the United States Geological Survey, is this season in charge of a Canadian Geological Survey party engaged in making a topographical survey of Vancouver island, B. C.

Edward V. d'Invilliers, of Philadelphia, was on Oct. 4 appointed by the governor of the State a member of the Contour Topographic and Geological Survey Commission of Pennsylvania, and has accepted the position.

Dr. R. W. Brock, director of the Canadian Geological Survey, has returned to Ottawa after a three-months trip to British Columbia, the Yukon and Alaska. He expects an increase in the gold output this year.

Frank Holman Probert and Walter Harvey Weed, announce their association as Weed & Probert, geological and mining engineers, with offices at 42 Broadway, New York, and Central building, Los Angeles, California.

S. B. Tyler, recently general manager of the Homestake-King Consolidated Mining Company, at Rhyolite, Nev., has taken the position of general superintendent of the Frontenac, Topeka and Aduddell mines, near Central City, Colorado .

W. M. Brewer has resigned as ore buyer for the Tyee Copper Company, to engage actively in the work of a mining-development company, recently organized by himself and associates at Victoria, British Columbia. Mr. Brewer is now in New York.

Edwin Higgins has resigned his position as assistant editor of the ENGINEERING AND MINING JOURNAL. After visiting several mining districts in the West and Southwest, Mr. Higgins will, on Dec. 1, open an office as consulting mining engineer in the Central building, Los Angeles, California.

Mason T. Adams, of Britannia Beach, near Vancouver, B. C., has resigned as general manager of the Britannia Mining and Smelting Company, and has been succeeded by R. H. Leach, formerly general superintendent at the Britannia. Mr. Adams will open an office, as mining engineer, at Denver, Colorado.

Obituary

Charles Beebe, agent at Rosario, Mexico for the Lustre Mining Company, died Oct. 7 at El Paso, Texas.

David Ingle died at Oakland City, Ind., Oct. 15. He had been prominent among Indiana coal operators for a number of years, and was president of the Ayrshire Coal Company.

Robert Aitchison, president of the Aitchison Metal Perforating Company, of Chicago, died there Oct. 8, aged 79 years. With his brother he went to Chicago in 1858 and organized the company of which he was the head.

H. W. Anderson, president of the Cedar Hill Coal and Coke Company, of Denver, Colo., died suddenly, Oct. 6, while on a visit to Overbrook, Penn. He had been interested in coal mining in Colorado for a number of years.

James Cherry, who died at Granville, Ill., recently, aged 69 years, was for a long time in charge of the Seatonville mine for the Spring Valley Coal Company, and later engaged with the Chicago, Milwaukee & St. Paul Coal Company and sunk a mine at Cherry, the village being named after him. He was also in charge of the shafts at Granville, Standard and other places. He had been in poor health for about a year and notified the company of his desire to resign, but the company declined to accept it.

Societies and Technical Schools

Appalachian Engineering Association—The next meeting will be held at Washington, Nov. 5 and 6, at the New Willard hotel. Addresses will be made by W. N. Page, Dr. Thomas L. Watson, D. C. Weller, Prof. R. L. Morris, E. V. N. Heermauce and others. Visits will be made to the terminal plant and to the new concrete bridge over Rock creek.

Scranton Mining Institute—The first meeting of the season was held at Scranton, Penn., Oct. 11. After an opening address by the president, John Hale, an address on the "Education of the Miner" was made by R. D. Towne. J. H. Dague, Jr., described a recent visit to several European coal mines. Capt. W. A. May, general manager of the Pennsylvania Coal Company, made an address on "Waste in Mining," and told of many cases of life and property loss, due to carelessness of employer and employee. Mine Inspector Hubert D. Johnson made a plea for education of the foreign miner, saying that it was one of the only means by which accidents could be avoided. He also scored many of the older miners for their carelessness.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 13—The Calaveras Copper Company has been organized in Boston under the laws of Delaware to take over the Union mines at Copperopolis, Calaveras county, owned by the Ames estate of Boston, and to commence active operations at once. This was the first mine in California to be productively developed on a large scale. As early as 1861 the mine produced about all the copper ores mined in the State. The mine paid dividends about that time and later on. Some of the ores shipped in early days ran as high as 15 per cent. copper. The Keystone, now a part of the Union, was a producer at the same period. About 1868 both mines were closed although there was good ore exposed at the time of the shutdown. Nineteen years later the mine was unwatered and the main shaft sunk to 600 ft. Operations were continued for a time and a smeltery built, but in 1892 active operations ceased as far as mining was concerned, though leaching of mine waters has since been continued and more or less cement copper produced. There is on the property a 100-ton smelter and a 400-ton concentrator. The vertical shaft is 400 ft. deep, and it was then inclined 67½ deg. east for an additional 240 ft. Joseph G. Hadley has been the superintendent for the past few years. The Union property comprises not only the Union and Keystone claims, but the Empire as well. The vein, which in these claims exhibits a maximum width of about 40 ft. with an average width of 15 ft., carries a succession of orebodies which are lenticular masses of sulphide copper ore (chalcopyrite) connected by stringers of ore. The water level is here very close to the surface, and the alteration of the sulphides has extended to a depth of only 30 ft. Three orebodies have been opened and worked. Two of these outcrop in the Union and one near the south end of the Keystone claim. These oreshoots dip eastward with the vein and also longitudinally to the north. The largest one, in the Union claim, is about 300 ft. long, from 20 to 40 ft. wide, and has been followed to a depth of 600 ft. One ore stope in this body from which ore was extracted in the '60s was 40 ft. wide, 80 ft. high and 100 ft. long. The underground openings of the Union and Keystone claims are connected and consist of several thousand feet of drifts, shafts, stopes, etc. Nine levels have been run and six shafts sunk on both properties. Only one shaft is equipped with hoist, etc. Within the limits of these two claims, and outside of them along the lode through the company's property, prospecting has showed the existence of a number of other orebodies similar to the three developed orebodies at the surface. The Union orebodies carry no gold or silver. Since the mine was unwatered the last time two grades of ore were found, one a smelting ore averaging 11 per cent. copper, and the other a leaching ore averaging 5 per cent. The surface plant is extensive and includes hoisting and pumping plant, leaching plant, buildings, smelter, concentrating plant, etc. Accurate maps and records of the workings have been kept and it is estimated that there are several hundred thousand tons of ore blocked out above the depth of 900 ft. A large amount of ore has been hoisted to the surface which has never been treated. It has always been a matter of surprise that this mine, carrying ore of such high grade, should have been allowed to remain idle for so long a period when other copper properties not half so well equipped and with lower grade of ores have continued working. In the year 1866 the mine shipped over 56,000 tons of 15 per cent. ore and mined a large quantity of lower-grade ore which was not utilized. During the past year the production has been confined to what copper was obtained from the mine waters.

The old Plumas-Eureka property at Johnsville, Plumas county, formerly owned by the Sierra Buttes company, and later by the Johnston-Graham company, will, it is expected, soon be taken over by Nevada and Eastern capitalists. The last named company has expended large sums in building tramways, rebuilding the mills and putting in new machinery. When the old company closed down 400 men were employed, for the property had been a very large producer for years, but the grade of ore declined so it was necessary to quit work unless deeper sinking and greater expense were undertaken. It is thought that the old mine has a large amount of good ore left, and that more extensive development at greater depths will show up orebodies from which profit may be made.

At the northern end of Mono county at the head of Desert creek, there has been discovered a wide lode of good ore and many claims have been filed in the section. It is 15 miles north of Bridgeport and within four miles of the West Walker river. There is a wagon road from Bridgeport to within five miles of the camp, and a good trail from the road. There is plenty of wood and water and it is within four miles of the place where the California-Nevada Power Company has its power site. A town called Elm City has been laid out.

Denver

Oct. 15—In the Rangely oilfield, from five to 10 miles south of the survey line of the Moffat road near the Utah line, the operators are very busy exploring their ground in advance of the advent of the railway. The Emerald Oil Company, of Vernal, Utah, has 3200 acres which is being patented. Eleven derricks have already been erected, and the company has one pumping well at 820 ft. Enos Bennion is manager. This is a close corporation, with no stock for sale. Another close corporation with property adjoining the former, also with no stock for sale, is a St. Louis concern of which C. O. Baxter is manager. It is composed chiefly of St. Louis men, and owns 3000 acres. A machine capable of sinking 6000 ft. is already on the ground. Another large tract is owned by San Francisco people, who put down some wells five or six years ago, and had 200 ft. of oil in six of them. Loss of money in the San Francisco earthquake is said to be the cause of stoppage of work, but they have now reorganized. This property is southwest of Rangely.

The Modern smeltery at Utah Junction, on the Moffat road, three miles from Denver, is said to have accumulated several thousand tons of Clear Creek and Gilpin county ores, and has blown in. The manager states that they will now treat ore steadily and in spite of all opposition, though what the expected opposition is, is not stated. If this pyritic smeltery should prove successful, it will certainly be a great boon to the districts named.

In the Cripple Creek district, the breast of the deep drainage tunnel is now under Requa gulch, between Grouse mountain and Beacon hill, a distance from the portal of about 11,125 ft. The $160,000 which was needed to complete the work is now said to be available, and a letter has been issued to the various mining companies which subscribed the above amount, by the executive committee of the Tunnel company, asking for a remittance of the first instalment of 10 per cent. It is expected to complete the work in about one year. With the drainage problem solved, this wonderful mining district, which is credited with an output of one hundred and fifty million dollars in gold, may yet give up another hundred

millions, and all this from an area of four miles square.

A long drawn out case at law has just been decided, in which over 20 companies won their suit against Teller county for unjust taxation of their properties, claiming that these should not be taxed at a higher rate per acre than the lowest rate on producing property. They paid their taxes under protest, and this money, amounting to about $10,000, will have to be refunded by the county. Twenty other companies will benefit indirectly by the decision, from which there is no appeal.

Another vexatious and bitterly fought lawsuit, which has been in the courts for 17 years, is now said to be in a fair way to be settled out of court. This is the suit of James Doyle against James F. Burns, for half of the latter's share of the Portland mine, Doyle claiming that he "grub staked" Burns. Doyle once secured a judgment against Burns for $650,000, and on appeal by the latter, the case was sent back to the district court. In a lower court, Burns won, and the case was again going to the supreme court, when the litigants, it is now stated, "got together."

In the San Juan region, especially in the neighborhood of Telluride, the recent washout of tracks of the Rio Grande Southern, and the shortage of cars which exists throughout southern Colorado, is working great hardships to the mines, which cannot get the ore out or coal in, and as freezing weather has set in, the trouble is serious.

Butte

Oct. 13—The Butte Central Copper Company, owner of the Ophir mine, expects to resume, arrangements having been made for the financing of the company. While everything at the mine is ready for work, the trouble thus far has been that the new company has not been able to pay off the indebtedness of the old Butte Central and Boston Copper Corporation, its predecessors. The latter corporation was forced into bankruptcy some time ago and in winding up its affairs the creditors allowed the mine to be purchased by one of their representatives, who was to hold it until the creditors had been paid off in full, when the property was to be delivered to the newly formed Butte Central Copper Company.

The management of the Butte & Superior Copper Company state that a contract has just been closed with the American Metal Company whereby all the zinc ore mined by the former will be purchased by the latter, during a period of 10 years. The American Metal Company also agrees to advance funds for the erection of a mill. The ore from the mine has been shipped to the Butte Reduction Works for several months, but when the production of Senator Clark's Elm Orlu mine became such that it was sufficient to demand the entire capacity of the Butte Reduction Works zinc mill, the reduction works refused to treat the Butte & Superior's ore. The Metal company will also furnish funds for the improvement of the surface plant of the Butte & Superior property with a view to enlarging the mine's production. Among the improvements will be a large electrically driven compressor plant, and skips will be installed.

At a meeting of stockholders of the Keating Gold Mining Company in Butte the capital stock was increased from 250,000 to 400,000 shares of the par value of $5. The additional 150,000 shares authorized will be offered to the present stockholders in proportion to their holdings, until Oct. 15, and those shares not taken by that time will be underwritten by Gay & Sturgis, of Boston.

The Amalgamated mines are now producing their usual tonnage. At the Leonard new precipitating tanks, larger and of modern construction, are being installed. From the boiler plant to the compressor room a tunnel is being run, in which will be placed the steam pipes for the operation of the compressor plant. At the Badger State, at the foot of a steep mountain north of Butte, a draining ditch has been run for the purpose of keeping the rain water from running down onto the mine workings. An excavation for the boiler plant has been cut into the side of the hill and the stone retaining wall has been completed. At the Pennsylvania an additional pump station is being cut on the 1800-ft. level, and when completed a new electrical pump of large capacity will be installed. This has been rendered necessary owing to the fact that the crosscut south on the 1800-ft. level of the mine ran into what is supposed to be an old crevasse, which was filled with water, and the outflow has materially increased the amount of water which finds its way into the shaft. B. B. Thayer, president of the Anaconda Copper Company, has recently made an inspection of the Amalgamated company's smelter at Great Falls, and has announced that the plant will be enlarged by increasing the capacity of the concentrating plant 1000 tons per day, giving it a total capacity of 5000 tons daily. The other departments will be enlarged on a corresponding scale. Mr. Thayer states that the enlargement will be made just as soon as the experiments now being made with various concentrating jigs and classifiers are finished. The company wishes to determine the capabilities of each make of jigs and classifiers, so that plans may be made accordingly when the enlargements are made.

Salt Lake City

Oct. 15—The department of the interior has instructed the register and receiver of the land office to withdraw from entry 46 townships in San Juan, Kane, Garfield, Iron and Washington counties. The existence of petroleum in these counties has been investigated by United States Geological Survey and the discoveries were considered so important that the reports were telegraphed to Washington and the acting secretary telegraphed instructions to the land office. Prospecting for oil and drilling has been going on for several years in Utah, and in some instance the holes have been capped so that the operators could increase their holdings. A tract of phosphate land in the northwestern corner of Weber county was also withdrawn.

Labor troubles at the Utah Copper mine at Bingham made it necessary to suspend mining operations for almost a week and to call out a force of a hundred deputy sheriffs. The strikers, mostly foreigners, were given an increase in wages from $1.75 to $2 a day. As this company is mining and milling 8000 tons of ore a day, the output of copper for the month of October will be materially affected.

A number of high officials of the United States Smelting, Refining and Mining Company have recently visited the Bingham Junction smeltery. They are on a tour of inspection of the company's holdings in Utah, California and Mexico. The party included W. G. Sharp, president; A. F. Holden, managing director; Frederick Lyon, assistant managing director; and Sidney Winslow, director.

It is expected that the copper output for the month of September will be the greatest in the history of Utah. The reports from the four big producers, the Utah Copper, Boston Consolidated, Utah Consolidated and Yampa show a material increase over August. The Utah Copper produces nearly half of the State's copper output and this company shows the best record for several months. The Utah Consolidated is reported to be getting copper at a little more than 5c. a pound, while the Utah Copper is said to be getting near the 8c. mark.

The smelter of the Utah Consolidated company which operated in Salt Lake valley for years and which was closed by the United States court in the smelter smoke decision, has been razed after lying idle for two years. Most of the structural steel will be used in the Tooele plant.

Cobalt

Oct. 15—The department of lands, forests and mines announces that a strip of land on the Gillies Limit, south of the Cobalt area and immediately to the south of the lots already disposed of, will be offered for sale by tender. It is 1200 acres in extent and will be sold in 20-acre lots, tenders for which will be received until Nov. 15. The conditions will be similar to those of the previous sales, viz., a 10 per cent. royalty on the output and a fixed sum to be expended in development. So far 900 acres of the limit have been disposed of, and after the land now offered

is alienated there will still remain 61,900 acres in the hands of the government. During the season the officials of the department have made considerable progress in the exploration of this area, and while no actual discoveries have been announced, it has been ascertained that the geological formation of the greater portion of the limit bears a general similarity to the rocks of the Cobalt area. This, though not a conclusive indication of the value of the area, encourages the expectation that it may be rich in silver and other minerals.

Several properties in the North Cobalt district will shortly resume operations. This is largely due to the discovery of high-grade ore made at the North Cobalt mine. A short time ago another new vein was discovered on this property, which shows about 30 in. of calcite, with low silver. The management is at present sinking a winze on it from the 200-ft. level. The companies that will in all probability extend operations are the Kanuck, Green Meehan, Red Rock and Cobalt.

Toronto

Oct. 14—The merger of leading Canadian cement companies as recently completed under the name of the Canada Cement Company, Ltd., includes the following plants: International, Hull, Que.; Canadian, Marlbank, Ont.; Western Canada, Exshaw, Alta.; Vulcan, Montreal; Lakefield, Montreal and Lakefield, Ont.; Owen Sound, Shallow Lake, Ont.; Alberta, Calgary, Alta.; Belleville, Belleville, Ont. and Lehigh, Belleville. The total capital is $29,000,000—consisting of preferred stock $10,500,000; common stock $13,500,000 and bonds $5,000,000. The board of directors comprises Sir Sandford Fleming, president, J. M. Kilbourn, J. R. Booth, George E. Drummond, J. S. Irvin, Hon. W. E. Edwards, W. D. Matthews, R. W. Kelly, Hon. Robt. MacKay, W. R. Warren, W. H. E. Bravender, Hon. George A. Cox, W. M. Aitken, Chas. H. Cahan and E. M. Young.

On Oct. 9 a large delegation of Montreal capitalists and business men went to Ottawa as the guests of the company on a visit of inspection to the plant of the International, the largest in the merger, situated in the adjoining town of Hull. This plant has an output of 600,000 bbl. per year. The various operations were explained by J. S. Irvin, managing director, who stated that the effect of the merger would be to save upward of $700,000 per year in freight charges by arranging that each of the plants would first supply the locality tributary to it. It is also hoped to develop a large export trade with the West Indies, South Africa and Mexico. To meet competition abroad it is proposed to ship the cement in clinker form, having grinding mills at the terminal points on the seaboard for the final grinding processes.

As a result of this merger which places the Canada Cement Company in a position practically to control the trade, the smaller companies in western Ontario dependent mainly on local trade have been put on the defensive, in consequence of the pressure which has been brought to bear to force them into the merger. The threat has been made that in case they remained outside the merger would employ "Standard Oil methods" to crush them. In consequence of the feeling of insecurity created by the amalgamation of the larger concerns negotiations have for some time been in progress for a consolidation of a number of the independent companies including the following, capitalized at the figures given. Brant, of Brantford, $500,000; Colonial of Wiarton, $800,000; Hanover of Hanover, $500,000, Imperial of Owen Sound, $300,000; Ontario of Paris, $450,000; Bell's Lake of Markdale, $500,000; Superior of Orangeville, $500,000; Western Ontario of Attwood, $500,000, and St. Mary's of St. Mary, $500,000. All these smaller companies use marl as their raw material, whereas the great bulk of the output of the companies embraced in the big merger is from rock—and it is claimed that the companies producing from marl can secure greater uniformity in quality than the others and on that account could hold their own in fair competition. It is the intention shortly to apply for a charter of incorporation, but details have not yet been arranged.

The marl-using companies outside the merger take the position that while they are not anxious for a contest, they are prepared if attacked to retaliate effectively by exposing the methods by which the merger was effected. They assert that there is considerable water in the capitalization contrary to the law regulating the formation of companies and that promises were held out that an early effect of the combination would be an increase of the price of cement to $2 per barrel or more—an impossibility in view of the extensive importation which would result.

Mexico

Oct. 12—The prospects for the consideration of the new mining law by the senate at present do not seem favorable. The matter has been held up in committees, and is now deferred owing to the visit of the president to El Paso, in connection with the meeting with President Taft. The general opinion seems to be that the new law will be substantially a revision and modernization of the present statutes and that the law when enacted will be satisfactory to the mining interests of the country. At any rate the opinion seems to prevail that the law will not be passed now at this session of congress which adjourns in December. Some disappointment is felt over the delay in the enactment of the law, which delay has undoubtedly had a bad effect upon pending mining negotiations in the country. The recent purchase of the Santa Gertrudis and the negotiations for the La Blanca mine have in a way offset any doubt about the future of the Mexican situation, for these negotiations are of such a magnitude that they carry with them a presumption of faith in the continuation of satisfactory legislation and satisfactory conditions in the republic.

An authority on the Mexican mining situation referring to the delay in the enactment of mining law says: "There is an inexplicable delay about this important matter which has been pending for over three years to the great annoyance and loss of the mining industry."

During July the Mexican federal regulation expired which provided for the drawback of duties paid on machinery for new mining or metallurgical plants. The only way in which this refund can now be obtained is to follow the usual course pursued in obtaining a special concession. Briefly, this consists in making personal application and representation to the department of fomento and explaining convincingly the benefit which will accrue to the district generally. The department requires complete plans for its files. The construction of the plant must be completed within a certain time, and before the refund is made the work must be approved by an engineer appointed by the department and paid by the concessionnaire. For any but the largest plants, the delay incident to the routine of application for such a concession as well as the necessary expense, will not be warranted by the saving in duty, which is only 1.65 pesos per 100 kg. on mining machinery.

London

Oct. 9—The Canada Cement Company, Ltd., is offering in London cumulative preference shares carrying 7 per cent. interest to the amount of $1,175,000. The price asked per $100 share is $93. Purchasers of this stock are offered one share of $100 par in the common stock of the company for four preference shares purchased.

Purchasers who do not want to take up the bonus shares are offered by the Canadian Agency, Ltd., $25 cash for each share surrendered. The Canada Cement Company was incorporated to amalgamate a number of companies making portland cement in Canada, with the object of avoiding cut-throat competition. According to the Canadian Agency, Ltd., the company promoting the present fresh issue of capital, the cement company hopes to sell this year 4,000,000 bbl. and to secure a profit of $2,000,000 on an estimated sale price of $1.20 per barrel. A similar issue to that now made was offered in Canada a short time ago, and it is stated, was oversubscribed.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Cordova—Construction of the Copper River & Northwestern railway from Cordova to the Bonanza country will be carried on all winter. Sledges will be used to freight what supplies cannot be taken up the river by steamboat.

Skagway—The "Princess Royal" sailed from Skagway, Oct. 5, with 2200 lb. of gold dust, valued at about $432,000, representing a part of the season's cleanup for that section.

Nome—The steamship "Senator" sailed from Nome with nearly a quarter of a million dollars of gold, and a large number of mine operators who are on their way out to spend the winter.

Arizona

COCHISE COUNTY

Swisshelm and Heffron—These companies are operating in the Swisshelm mountains in the eastern part of the county, and have recently made important discoveries of copper-gold ore.

Arizona United Mines Company—The 100-ton copper smeltery at Johnson in the Dragoon mountain is in operation, treating ore from the Arizona United and Black Prince.

Calumet & Arizona—The company denies that it is negotiating for the Shattuck-Arizona.

GILA COUNTY

Arizona Commercial—The 500-ton smelter at Copper hill, 4 miles east of Globe, is in operation. A converter will be added. J. W. Bennie is manager of the company and D. L. Williams, of Clifton, Ariz., smelter superintendent.

Inspiration—Drifting continues at the 400-ft. level of the Joe Bush shaft in all directions in ore, estimated to average over 25 per cent. The north drift has been opened for a distance of 60 ft.; the south drift is in ore an equal distance; the east drift, 30 ft., and the west drift, 40 ft., the ore here disclosed containing nearly 3 per cent. copper. The Scorpion shaft, about 2500 ft. northwest of the Joe Bush, is in carbonates at a depth of about 100 ft. The drill cores indicated that sulphides would be encountered between 150 and 200 ft. Thomas R. Drummond, formerly at the Cactus mine at Newhouse, Utah, will take charge of mining operations on Nov. 1, with office at Globe.

GRAHAM COUNTY

Arizona Copper Company, Ltd.—Production for September was 1236 tons of copper. A crosscut in a development tunnel in the Simpson group has in the one end, entered 20 ft. into a body of oxide and sulphide ore averaging 9 per cent. copper, and in the other end about 150 ft. has entered a body of carbonate ore, 30 ft. wide, averaging about 3¾ per cent. copper.

SANTA CRUZ COUNTY

Alto—Several men are at work on the east extension on the vein from the tunnel, and have developed a body of lead-copper-silver ore not hitherto known. John H. Prout, Jr., manager.

Augusta—Manager William Kemp has formed a syndicate of railroad men to work the mine, 11 miles from Patagonia. The ore hoisted daily is about equal to the shipments to the smeltery at Globe.

San Antonio & Arizona—Charles Harrison, superintendent, has taken over J. W. Hackett's claims (the Rosario), near the Salero and is taking out ore for shipment.

Salero—The company is driving on the 400-ft. level in oxidized ore, carrying copper and silver with pockets of fine silver ore. The vein is 200 ft. wide. Superintendent, W. E. Balcom.

California

AMADOR COUNTY

Orr—Sinking is going on near Plymouth, L. Griffith in charge. The mine is being opened by men connected with the Kennedy company.

BUTTE COUNTY

Gold River—The company has installed pumping machinery on the Bumble Bee mine at Oroville.

CALAVERAS COUNTY

Mountain King—R. B. Parke has obtained ownership of the mine at Hodson and will start it up.

Bob Paul—The gravel claim at Chili gulch near Mokelumne hill is to be reopened under J. Rooney, of San Francisco.

EL DORADO COUNTY

Wagner—The mine at Kelsey, recently known as the Douglas Brothers' mine, managed by R. S. Henderson, is showing good ore from a blind vein in a crosscut tunnel. The 10-stamp mill is to be moved from the hill to the mouth of the tunnel.

Mount Pleasant—Twenty men are working this mine near Grizzly Flat under A. V. Judson, and the 10-stamp mill has been started.

SHASTA COUNTY

Mammoth—The company at Kennett has now 600 men at work, and daily ore shipments are from 1200 to 1700 tons. The construction of a two-compartment shaft at the Quartz Hill mine has been begun.

SIERRA COUNTY

Kate Hardy—This mine, at Forest, is being reopened. J. W. Morrell, manager.

Cleveland—Twenty men are at work in the tunnel at Sierra City. The mill is being overhauled and compressors installed.

Tabor—The mine at Gibsonville, a continuation of the Bellevue, was recently purchased by Theodore L. Harlow.

SISKIYOU COUNTY

Cherry Creek District—Near Yreka, the Mount Vernon, Ironsides, Cherry Hill and Schroder mines are being worked.

Yellow Butte—This property near Edgewood, after lying idle six months, has been started up.

TRINITY COUNTY

Headlight—A 40-stamp mill with chlorination plant is being built at Carrville.

TUOLUMNE COUNTY

Duach—At this mine, Jamestown, the shaft is being retimbered. A larger force will be employed.

Yrma—Arrangements for obtaining water having been made, the mill at this mine will be started.

Hazel Dell—A lode 6-ft. wide carrying free gold has been uncovered.

Poor Man's Friend—The claim near Tuolumne has been bonded to Clinton Manley, of Dunsmuir, Cal., and work commenced.

Colorado

LAKE COUNTY--LEADVILLE

Little Ella—A body of gold ore has been opened on this property at South Evans gulch, at the second contract. This is the first discovery of the ore of this horizon in this section.

Hill Top—The mine in the Horseshoe district which has been producing heavily in lead and zinc ore recently disclosed in the lower level a body of gold-silver ore which is being explored.

Wall Street—An electric plant will be installed on this property on Little Ellen hill, and shipments commenced.

SAN JUAN DISTRICT

Henrietta—The company has purchased the assets of the San Juan Smelting and Refining Company at Silverton. George H. Craft is manager.

Tomboy—This mine in Savage Basin, at 12,500 ft. elevation, under the management of David Herron, of Telluride, reports for September 7500 tons of ore crushed, yielding 44,000 gold bullion, and concentrates of a value of $5500.

SUMMIT COUNTY

Buffalo Placer—The property at Breckenridge, controlled by L. Kingsbury, has closed a deal for an extensive hydraulic plant, which will have a capacity of 6000 cu.yd. daily.

Wellington and Country Boy—These properties are shipping lead, silver and zinc ores extensively.

TELLER COUNTY—CRIPPLE CREEK

Republic—Sherman Bell has taken a bond and lease on the properties on Beacon hill and will sink the main shaft to 1000 ft. and develop extensively. The property will have the benefit of the new drainage tunnel.

Roosevelt Tunnel—Water has been encountered in the north heading for the intermediate shaft. No vein or dike shows in the heading.

Kansas

United Zinc Company—The company through C. C. Playter has purchased the 120-acre Foster tract west of Galena. The land is undeveloped but surrounded by mines. It will be thoroughly prospected by the new owners.

Nymo—The company has completed the new 300-ton mill on the Maggie Taylor land at Galena. H. A. Waterhouse, manager.

Empire Electric Power Company—This company, capital $6,000,000, has bought the land of Rains Brothers at Riverton, Cherokee county, Kan., north of the steam plant of the Spring River Power Company. A power plant will be built to generate 20,000 h.p., costing $2,000,000.

Michigan

COPPER

Michigan—The company has laid off 150 men, reducing its force to 25, which will carry on exploratory work during the winter, other operations to be suspended for a time, owing to the inability of the company to meet expense at the present copper price.

Lake—The crosscut from the 5th level has been extended 25 ft. into the formation and reveals a fine mineralization. The extension of drifts at the 3d and 4th levels continues to open a fine grade of rock. A diamond drill is securing data for the location of a second shaft.

New Arcadian—The drill to tap Baltic lode is down about 700 ft. but it is thought that it will be necessary to sink to about 1500 ft. before the lode will be reached.

Hancock—The excavation has been completed and the foundations started for a new steel engine and compressor house. In this building will be housed the present Sullivan hoist and a new hoisting engine capable of handling the hoisting requirements to a depth of 4000 ft. at a speed of 3500 ft. per minute. The compressor building will contain the two present compressors of 13- and 16-drill capacity and a new air engine of 30-drill capacity. A structural steel boiler house, will contain two batteries of four boilers each of the return-tubular type, and in short time a steel shaft and rock house will be erected on the site of No. 2 shaft, which is nearing the point where the West lode will cut.

Section 12—A copper-bearing amygdaloid formation has been cut with the drill at 350 ft., thought to be the Baltic lode.

IRON

Maas—The deposit at Negaunee is proving one of the largest in the Marquette range. The Cleveland Cliffs company is making large shipments from it.

Lot 3—The property at Crystal Falls belonging to the International Harvester company will soon become a shipper.

Mary Charlotte—More than 500 men are employed by the Brietung interests on this mine at Negaunee.

Minnesota

IRON

Armstrong Lake—The company has secured options on land in Section 7-62-13, and Section 13-62-14, Vermilion range. A new diamond drill has been received and exploration will be rushed as soon as the camps are completed. Headquarters will be at Robinson.

Vermilion Steel and Iron Company—The Sheridan claim in Section 5-62-15, near Tower is being prospected by the company.

North American—A drill is working on Section 33-62-15, at Tower Junction for this company.

Oliver Iron Mining Company—The company is preparing to open two new mines at Hibbing, the Uno and Dale. They will be open-pit mines.

Missouri

JOPLIN ZINC-LEAD DISTRICT

Prosperity—Meloan Brothers, of Cleveland, who have been operating at Duenweg and north of Webb City, have secured from the Boston-Get There Company a lease on the 40 acres north of Prosperity and will begin operations for the reopening of the tract, remove the American Beauty No. 2 mill from Duenweg and place it on the lease.

Producers—This company of Miami has purchased the 10-acre lease, mine and mill of the Radish Hollow Company at Belleville for $20,000.

Green Dog—The company has secured the Florence mine and mill east of Joplin and has remodeled the mill. J. H. McClannahan, Joplin, superintendent.

Picher Lead Company—The company is doubling the capacity of its litharge plant and will erect a building at a cost of $15,000. The plant will have a capacity of 75 bbl. of litharge daily.

Montana

BEAVERHEAD COUNTY

Calumet-Montana—At the company's Dark Horse mine work on the 3000-ft. tunnel will be begun shortly. The property is on the line between Montana and Idaho and the tunnel will connect the two States. The tunnel will attain an average depth of 700 feet.

BUTTE DISTRICT

Davis-Daly—At the Portland meeting the Heinze interests held a control of the proxies and elected a board of five members as follows: Augustus Heinze, H. Mason Raborg, L. S. Levy, George Baglin and W. C. Shaw. The Colorado mine of the company is shipping upward of 175 tons daily, and Mr. Heinze reports that by Jan. 1 the mine will be in position to ship 500 tons per day. The ore will be treated at the Basin concentrator for a time.

Tuolumne—Forty men are employed drifting east on the 1400-ft. level. The drift is now in 180 ft. and the face shows 15 ft. of ore. The drift will be continued an additional 211 ft. to the east end line and then stoping will be begun. About 100 tons are being shipped daily from the sill floor alone, and when stoping is begun the output should be greatly increased. From the point at which the crosscut intersects the lead on this level the distance to the west end line is about 560 ft., and as yet the orebody on this side of the crosscut has not been explored. The sump in the shaft is 50 ft. below the lowest level and will hold all water which comes into the mine for a period of 60 days, when the water is tanked out. The accumulation of the 60 days can be tanked out in less than eight hours. The doing away with the necessity for pumping is thus quite a factor in reducing the operating expenses of the property.

Nevada

CHURCHILL COUNTY

Fairview Eagles—Working shaft on this property at Fairview will be sunk to 300 ft. Monthly shipments reported 40 tons.

ESMERALDA COUNTY—RAWHIDE

Grutt-Balloon Hill—The lease is installing a compressor and will put in machine drills and sink the shaft to the 500-ft. No more ore is to be extracted till the mills are in working order.

Kerns No. 1—The lease which joins the Grutt-Balloon Hill will commence sinking main shaft Nov. 1.

Golden Arrow—Ore has been struck which is significant for the district, as the territory has been lacking of any ore so far.

Victor—The lease has encountered ore on the lower level, which proves the ore to 300 ft. The owners will add 10 more stamps and a cyanide plant to the old Murray mill, recently purchased.

LINCOLN COUNTY

Prince Consolidated—Water has been encountered in a winze from the 550-ft. level with first appearance of quartzite. The fissure of high-grade ore continues into the quartzite. The shaft has reached the quartzite at 600 ft. and will be continued to determine whether true water level has been found. E. L. Godbe, manager of Prince Consolidated and Ohio-Kentucky has gone east on business pertaining to consolidation of latter property with Nevada-Utah.

STOREY COUNTY

Mexican—The three-compartment winze from the 2000 level to the 2300 is down 200 ft. On the 2300 level a drift has disclosed high-grade quartz which is attracting much notice.

Baker—The property east of the Comstock is showing good ore. Other operations are under way in the locality. Negotiations for the sale of the Baker are under way.

WHITE PINE COUNTY

Nevada Consolidated—Notice has been given of the annual meeting to be held at Portland, Me., on Nov. 2, at which time a resolution will be presented authorizing an issue of 400,000 shares, increasing the present capital stock of 1,600,000 shares, of the par value of $5, to 2,000,000 shares of an aggregate value of $10,000,000, for the purpose of acquiring the capital stock of the Cumberland-Ely Copper Company at the ratio of 3¼ shares of the latter for one share of the former company. The usual annual business, including the election of a board of directors, will also be transacted.

New Mexico

GRANT COUNTY

Savanna Copper Company—The mines, smeltery and equipment of the Comanche Mining and Smelting Company at Silver City were bid in by the Savanna Company at court sale for $415,883. It is expected that the smeltery will now be started. E. A. Wayne is manager.

OTERO COUNTY

Orogrande Smeltery—Repairs on plant are finished and the company is apparently planning to resume.

New York

ESSEX COUNTY

Cheever Iron Mine—The controlling interest in this mine, north of Port Henry in the Lake Champlain district, has been sold by the Presbrey estate to the Bethlehem Iron Mines Company, a subsidiary of the Bethlehem Steel Corporation. The Cheever is an old mine, having been first worked nearly 100 years ago, but it still contains large reserves and the grade of the ore is about the highest in the district. Witherbee, Sherman & Co. retain an interest in the mine, and will for the present conduct its management. It is understood that a considerable amount of money is to be spent in improvements and in machinery.

Oklahoma

Miami—The Swastika mill has been sold to the Miami-Joplin Company, and is being erected on the Sullivan lease. The Swastika was the farthest mine to the south and has been worked out, while the Sullivan lease is in the heart of the camp and has developed a mine between the Turkey Fat and Old Chief mines. W. G. Stevens, Joplin, is manager of the Miami-Joplin company.

Morning Star—The mine at Miami has struck a rich prospect and will build a mill.

Lincolnville—The Sweeney plant has been rebuilt and the mine reopened.

Oregon

DOUGLAS COUNTY

Kelso—The company, securing claims on Steamboat creek, is putting in a 10-stamp mill at the Mayflower. Two water wheels will be installed. The mill will handle 1000 tons a month.

JOSEPHINE COUNTY

Sugar Pine—After being abandoned 50 years the mine is again producing. Modern equipment will be added.

Alameda Consolidated—Work is now concentrated on the Alameda mine, sinking the vertical shaft to 500 feet.

LANE COUNTY

Sweepstake—S. J. Brund, owner of the mine on Elephant mountain, near Bohemia, has received a two-stamp mill.

West Coast—The property at Orseco has ore blocked out and the 30-stamp mill will soon be started.

Parker-Healey—H. H. Parker, manager of the property near Orseco, has uncovered ore in the lower tunnel. A 1200-ft. tunnel has been driven during two years.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—The financial statement for August and the two months of the fiscal year from July 1 to Aug. 31 is as follows:

	August.	Two Months
Earnings	$1,780,163	$3,377,259
Expenses	1,842,089	3,533,424
Deficit	$61,926	$156,165

For the two months, as compared with last year, there was a decrease of $699,535 in earnings and of $514,333 in expenses; this year's deficit of $156,165 compares with $29,037 net earnings last year.

Lehigh Coal and Navigation Company—It is believed that fire which has been burning for a number of years in the old mine at Summit Hill has been finally extinguished. A fireproof wall has been built at heavy cost to shut off the fire.

Mineral Railroad and Mining Company—This company has decided to install electric haulage in its collieries near Shamokin. Contracts are to be let for the electric equipment at once.

BITUMINOUS COAL

Central Pennsylvania Coal Operators' Association—At a meeting held in Philadelphia last week the following officers were elected: B. Dawson Coleman, president; J. B. Irish, vice-president; Charles W. Mills, secretary and treasurer; executive committee, L. W. Robinson, G. S. Ramsay, F. H. Wigton, T. H. Watkins, R. H. Shillingford, W. J. Steineman, Ray A. Hatfield and Rembrandt Peale. The association is composed of mine operators in the Central Pennsylvania district, and its object is to secure a lower mining rate, as the present rate, it is claimed, is so high as to prevent competition with other districts for trade.

Franklin Coke Company—This company has a plant of 40 coke ovens now completed and ready to be put into operation at once. It is proposed to add to the number of ovens in a short time. James S. Braddock, of Uniontown, is president.

South Dakota

Montezuma—This and adjoining properties are in negotiation to a British syndicate represented by Robert Bunce, who is expected soon to come to the Black Hills district to start diamond-drill exploration. The properties were examined by H. S. Denny, of Mexico and London, last summer. They are near Rochfort.

Texas

EL PASO COUNTY

Republic—At a company meeting at Dallas it was decided to resume work on the zinc properties in the Quitman mountains, 80 miles east of El Paso.

BREWSTER COUNTY

Quicksilver Deposits—Discoveries have been made 30 miles north of Boquillas in the southern part of the county, 50 miles east of Terlingua. Thomas Locke, of San Antonio, will develop the properties.

Utah

BEAVER COUNTY

Cedar-Talisman—A large body of zinc ore has been found in addition to the silver and lead deposits already uncovered.

Moscow—The mine has increased its shipments. A large amount of prospecting and development work is being carried out in addition to the regular operations.

Commonwealth—Four and a half feet of high-grade carbonate ore was broken into by a raise from the tunnel level of the Commonwealth Mines. The vein in which the raise is being driven has been prospected for 150 ft., and affords 350 ft. of good stoping.

JUAB COUNTY

Centennial-Eureka—Work is progressing rapidly on the tunnel to tap the shaft on the 500-ft. level. As work is being pushed from both ends, 400 ft. a month can be accomplished so that the 3000 ft. will be completed in six months. The tunnel will take care of a large flow of water and facilitate the transportation.

Selma Consolidated—The control has passed from Jesse Knight and associates to H. A. Leach and Charles Tyng. The company owns the northern extension of the Colorado zone and an 800-ft. tunnel has opened up a characteristic vein of the formation.

Chief Consolidated—Contracts have been let for the construction of an assay office and ore bins for the various mines included in this consolidation. Walter Fitch, manager.

Dragon Iron—Fifty men have been laid off at the Dragon Iron since the closing of the Tintic smeltery. Arrangements are pending with the United States smeltery to handle the present 400-ton output of high-grade iron ore.

Iron Blossom—The regular 8c. dividend on the Iron Blossom was passed this month. The delay caused by changing ore shipments from the Tintic to the United States smeltery is given as the reason.

May Day—The 1100-ft. mark has been reached in the May Day shaft. Drifting from this point will start as soon as a station is cut.

SALT LAKE COUNTY

Utah Apex—The mine at Bingham made for the year ended Aug. 20, a mining profit of $124,185 despite the waste due to treating its second-class ore in the old mill now being remodeled. The annual report shows that 33,407 tons of ore were mined, of which 9525 tons were first-class ore and 23,872 milling ore.

Emma Copper—Operations at the mine will be resumed at once.

SUMMIT COUNTY

New York Bonanza—The shaft is down 900 ft. in mineralized quartz. After sinking 125 ft. more drifting will be started.

UTAH COUNTY

Mountain Dell—Another strike has been made in the Mountain Dell at American Fork. The ore is a silver-lead carbonate. The Mountain Dell recently connected its upper workings with the tunnel which enters the ground on the 600-ft. level.

Washington

FERRY COUNTY

New Republic—The company will install a motor in Granite creek to pump water for the mine. A carload of sacked ore to Tacoma, assayed $200 per ton. The company is now shipping 200 tons per week.

Ben Hur—The lessees are employing nine men on the 125-ft. level. 100 tons of ore per week is being shipped.

Black Tail—An order for a compressor and power drills has been placed.

Flag Hill—The mine which has been idle for several years has passed into the hands of the Flag Hill Mining Company. John E. Gatenbein, manager.

KING COUNTY

Superior—A new seam of coal has been disclosed at the mine. The company is at work on Nos. 6, 0, 2 and 4 of the Issaquah veins.

Wisconsin

ZINC-LEAD DISTRICT

Platteville—A company has been organized to prospect by drill on the George Spiese land northwest of the Klar-Piquette.

Hodge—The mine has been unwatered and operation begun under new management.

Big Four—The Trego mine and equipment are being placed in shape for steady production. The Gritty Six mine, at Cuba City, will be reopened. P. R. Grey, Platteville, superintendent.

Lawrence—Mining will be resumed and a 50-ton mill erected. T. F. Cummins, Platteville, president.

Wisconsin Zinc Company—Two churn drills have been set to work on the land recently obtained from the LaFayette Land and Mining Company. Drifting has been commenced at the Drumm shaft, which showed 32 ft. of jack ground.

Kennedy—The Mineral Point Zinc Company has bought the mine, at Hazel Green, including the fee to 120 acres, at $250,000. This property was formerly held at $500,000, but was sold at a sacrifice in the effort to save from failure the First National bank of Mineral Point, Wis. The mine is equipped with two concentrators and is the largest producer in the district.

Wyoming

FREMONT COUNTY

Williams-Luman—The vein at Copper mountain is reported 130 ft. wide at the 800-ft. level, carrying copper, gold and silver.

Canada

BRITISH COLUMBIA—ROSSLAND

Le Roi—The most important work in progress is the driving of crosscuts on the 1650-ft. level to open the mine at that depth to allow of the diamond-drill bores being made diagonally so as to prospect the ground down to 2000 ft., or deeper, much more effectively than would be done were the holes to be sunk vertically. At the ends of the crosscuts, about 200 ft. from the main level, stations will be opened to a size sufficient for the convenient working of the drills. A second useful purpose will be served by the driving of these crosscuts, namely, they will prove whether another lode, not heretofore believed to carry ore below the 1000-ft. level, is ore-bearing at the greater depth now being developed. The only ore being taken out is that encountered in the course of development work being done in different parts of the mine, consequently the smeltery at Northport remains idle.

Le Roi No. 2—Ore shipments to the smeltery for nine months, to Sept. 30, total about 24,000 tons, as compared with 22,000 for the corresponding period of 1908. About 14,500 tons of lower-grade ore have been put through the concentrator, bringing this year's total production up to about 38,500 tons. Ore is being mined from various drifts and stopes down to the 700-ft. level. Steady progress is being made with the deepening of the Josie shaft, which is now down about 1200 feet.

Center Star Group—Published figures show that the Consolidated Mining and Smelting Company's Rossland mines have this year maintained production on a similar scale to that of last year. The total quantity of ore shipped to October 2, is stated at 128,500 tons, as against 127,250 tons to October 3, 1908. Daily shipments range between 400 and 600 tons, the latter being an exceptionally large output. Ore receipts at the company's smeltery at Trail, from all sources, have averaged about 40,000 tons a month for the three months last past. This includes gold-copper ores from Rossland, copper-gold ores from the Boundary district, silver and silver-lead ores from East and West Kootenay, and concentrates

from several comparatively small gold-quartz mines. The capacity of the company's lead refinery at Trail is being increased from 70 to 120 tons of refined lead per diem. Announcement has been made recently of an intended increase of capital from $5,500,000 to $7,500,000, a special meeting of stockholders having been called to authorize this.

NOVA SCOTIA

Dominion Coal Company—The number of miners at work in this company's mines is increasing, and the probabilities of success for the strikers are gradually disappearing. About 1700 men are still out, though there have been a number of desertions from the strikers. The output continues to show a steady increase, the production of coal for September being 188,500 tons as compared with 153,908 tons for August and 135,604 tons for July—the first month of the strike.

ONTARIO

Imperial Gold Mines Company—On the 9th inst. the court in Toronto granted a winding up order against the company at Manitou lake on the application of the Imperial bank. The liabilities are said to be over $100,000, and the property of the company is encumbered by a mortgage to secure a bond issue of $200,000, the bonds being pledged for advances amounting to $20,000. The bank has obtained judgment against Anthony J. Blum and Barbara Blum, of Brookline, Mass., for $20,000 and interest under a guarantee of the indebtedness of the company. Harry Vigeon was appointed interim liquidator.

Big Six—Rich ore was recently found at 165 ft. The shaft at Elk lake is now being put down to the 200-ft. level at which drifting will be undertaken.

O'Kelly—At the mine, Gowganda, a stringer running from vein No. 2 is appearing rich. A test pit was sunk showing that at 8 ft. the vein has widened to 3 to 4 in. of high-grade ore. Several sacks have been taken out.

ONTARIO—COBALT

Silver Leaf—A new vein has been struck 5 in. wide, yielding good ore, claimed to run 5000 oz. silver to the ton, at a depth of 100 feet.

Cobalt Lake—In drifting at the 195-ft. level on a vein near the McKinley-Darragh boundary which has yielded good ore, another 3-in. vein of calcite with rich silver contents was cut running at right angles to the drift. The new vein is being followed.

Kerr Lake—The annual report for the fiscal year ending Aug. 31 shows net earnings of $1,129,047, on an average monthly production of 222,387 oz. silver, of which $480,000 was paid in dividends. The cost of production was 12.38c. per oz. The silver yield was 2,668,648 oz., produced from 1072 tons of ore averaging 2489 oz., and 600,000 lb. of screenings. Figuring silver at 50c. the gross value was $1,344,324 and the cost of production. The balance sheet shows total assets of $1,031,434, and $475,889 cash on hand.

YUKON TERRITORY

Dawson—Alki creek has been staked the last few days. No. 11 is the highest claim. The Lone Star, Ltd., one of the new quartz mines made its first cleanup recently after a run of 380 hours, during which 100 tons of ore were crushed. Wm. Catto is president. The Canadian-Klondike Mining Company, Ltd., Jos. Whiteside Boyle, manager, will add two new dredges to its plant and install a plant to generate electrical power with water next year.

Mexico

CHIHUAHUA

Borquillas—There is unusual activity in this section south of Parral 25 miles. The ores, carrying gold and silver, are amenable to cyanide.

El Rayo—The mine at Santa Barbara crushed during September 4080 tons of an approximate value of $14.14 per ton, and the estimated net profits were $18,644, the same as August.

DURANGO

Lucia—The company, operating near San Gabriel, is to resume work, sending silicious copper ore to Torreon. W. Thomas Moore, manager.

Villar—Adolfo Villar and associates, of Torreon, are planning the erection of a 50-ton cyanide plant at a property near Santa Maria del Oro on the Parral & Durango railway.

Coneto—Fletcher McNutt Hamilton and Charles M. Parker are developing the La Bufa and other gold-silver properties in this section, reached via Durango. A plant is to be remodeled and cyanide added.

OAXACA

Leona—Fred Rickard, engineer of the mine at Totolapam, is considering the advisability of installing a flotation process. The present mill does not give the required saving from the fines.

Ocotes—Diamond drills for prospecting from the 10th level of the Ocotes mine, belonging to the Teziutlan company, are on the ground, but the men who are to run them have not yet finished work at the Flojonales property in Hidalgo.

Rio Seco—Machinery for the mill near Parian has arrived from Veracruz.

SONORA

Greene-Cananea—The Indiana-Sonora has been purchased on a stock exchange basis of the Greene-Cananea for 2½ of Indiana-Sonora. The controlling interest in the purchased property was with Phelps-Dodge & Co. It included 400 acres in the Capote basin and several thousand acres in the district elsewhere. There will be no new issue of Greene-Cananea stock as contributions from large interests will be forthcoming to cover the transaction.

Santa Eduviges—H. Y. Acock, operating the mine 35 miles south of Sahuaripa, reports the resumption. The last shipment netted at El Paso $7500 for 15 tons.

Armagosa—George J. Cole is taking charge at Tabatacochi, 18 miles east of Nacozari. The first shipments are at Calabasas.

Lampazos—Development work has been resumed at the properties at Moctezuma of the Banco de Sonora, formerly operated by the Lopez family. Under C. T. Dozier the mines will be put in shape and exploration carried on. A new milling plant will be installed.

TEPIC

Zapote—Work is in progress on a reduction plant at Jala of five stamps, a tube mill and cyanide annex, operated by water power.

Cambio—The company has decided not to resume operations until the price of silver advances. The mines and a reduction plant are in the Rosamorada district, and have been idle for some time.

Morocco

Riff—The iron mines involved in the trouble between Spain and the Moore, are reported sold to a German company, presumably affiliated with Krupps. The deposit is described as an "iron mountain" and is said to run 60 per cent., in iron. The Spanish company is said to have defaulted in the payment. The mine is some distance from the coast.

Peru

Chimbote Coal and Harbor Syndicate—This English company, capital £250,000, will produce 200,000 tons yearly from the Recuay coalfield, 64 miles from Chimbote on the Pacific. The coal is anthracite—analysis, ash, 6; volatile, 17.50; fixed carbon, 77.66 per cent.; calories, 6800. Contracts are sought at $7.50 a metric ton.

Spain

Rio Tinto—The chairman announces a dividend of 2s. 6d. on the preference shares and 30s. on the ordinary shares. In accordance with legal advice the English income tax is deducted on the dividends of the ordinary shares. Referring to the copper situation report says: "The world's stocks probably do not reach a figure represented by the normal consumption of three months, and should the demand for copper become as brisk as that which is recently developed for iron and steel, the stocks of the red metal would be none too large."

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 20—Coal trade in the West continues to increase, with a steady demand for steam fuel, while that for domestic coal has been stimulated by colder weather. Business is reported good at all the large centers, but there has been no considerable advance in prices.

The bituminous trade in the East shows a continued increase in demand. There is some trouble on account of car shortage, but otherwise the trade is running smoothly.

The anthracite trade has followed its usual course with no special incident.

Anthracite Trust Suits—Testimony continues to be taken in the Government suits against the alleged anthracite trust; but no witness of special importance has been brought forward.

Coal Traffic Notes

Coal and coke tonnages originating on Pennsylvania railroad lines east of Pittsburg and Erie, year from Jan. 1 to Oct. 9, short tons:

	1908.	1909.	Changes.
Anthracite	3,921,674	3,705,847	D. 215,827
Bituminous	25,553,697	28,194,223	I. 2,640,526
Coke	5,302,856	8,361,447	I. 3,058,591
Total	34,778,227	40,261,517	I. 5,483,290

The total increase this year to date was 15.8 per cent.

Coal receipts at Boston, nine months ended Sept. 30, reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite	1,274,144	1,233,882	D. 40,262
Bituminous	2,425,336	2,582,820	I. 157,484
Total domestic	3,699,480	3,816,702	I. 117,222
Foreign	289,850	177,903	D. 111,947
Total	3,989,330	3,994,605	I. 5,275

The foreign coal is chiefly from Nova Scotia.

Coal passing through the Sault Ste. Marie canals, season to Oct. 1, short tons:

	1908.	1909.	Changes.
Anthracite	971,083	916,740	D. 54,343
Bituminous	6,142,621	6,122,058	D. 20,563
Total	7,113,704	7,038,798	D. 74,906

The total decrease this year was only 1.05 per cent.

The Southwestern Interstate Operators' Association reports coal shipments for July as follows, in short tons:

	1908.	1909.	Changes.
Missouri	174,738	167,680	D. 7,058
Kansas	422,050	349,113	I. 72,937
Arkansas	132,970	189,269	I. 56,299
Oklahoma	214,658	203,290	D. 11,368
Total	944,416	909,352	D. 35,064

The total decrease was 3.7 per cent. Arkansas shows a large increase, in striking contrast to the other States.

Coal and coke tonnage of Chesapeake & Ohio Railway, two months, July 1-Aug. 31, short tons:

	Coal.	Coke.	Total.
New River	1,304,409	57,582	1,361,991
Kanawha	965,921	4,404	970,325
Kentucky	52,465	.....	52,465
Connecting lines	8,884	7,947	16,831
Total	2,331,679	69,933	2,401,612
Total, 1908	2,038,067	47,326	2,085,393

Deliveries this year to points west of mines, 1,193,589 tons coal and 31,214 coke; points east, 268,206 tons coal and 38,719 coke; tidewater, 869,071 tons coal; anthracite to line points, 873 tons. Total increase in shipments this year, 316,219 tons, or 15.2 per cent.

New York

Anthracite

Oct. 20—The anthracite trade got a little push from the cold weather which set in this week, and dealers report an increase of orders. The effect on the wholesale market will be more evident next week.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The trade shows an improvement, although there is nothing like a boom in sight. Still, coal is being absorbed in larger quantities and orders come from almost all directions. The Far East is the most active, but the Sound and New York harbor are doing pretty well, while all-rail trade is good. The principal topic is car shortage, which is getting worse on nearly all the roads, especially on the Baltimore & Ohio, where shippers are not getting more than 50 per cent. of the cars they ask for. Transportation, however, is a little better than it has been, coal coming through nearly on schedule time.

Prices are firmer than they have been for some time, and concessions are not in order. It can hardly be said, however, that there is any advance yet, though in some cases 5 or 10c. more has been asked for special coals.

In the coastwise trade vessels continue plenty and rates low. The advance usual at this season has not come as yet. New York harbor quotes on small vessels 50c. to points around Cape Cod with 5 or 10c. more to a few special points. On large vessels rates are 60@65c. from Philadelphia to Boston, Salem and Portland.

Birmingham

Oct. 18—Coal production in Alabama continues to approach normal output. There is a good demand for all grades of coal and the mining companies are now seeking miners, a scarcity of men having become decidedly apparent. Labor is scarce in all circles now and the coal operators are feeling it more than any others. There has been a steady improvement in coal prices lately. There will be no advance in wages around coal mines until the pig iron sold at the low prices that prevailed several weeks ago has all been delivered.

Coke is in strong demand. The resumption of operations at old coke ovens continues.

Chicago

Oct. 19—Sales of steam coal continue good, and those of domestic fuel have been started up by the colder weather of this week. Prices remain about the same, supplies being abundant enough to prevent any advance. Mines are inclined to increase shipments on the least chance of improvement in demand.

Illinois and Indiana coals bring, in general, $1.75@2.50 for lump, $1.65@1.75 for run-of-mine and $1@1.30 for screenings. Smokeless holds to $3.55 for lump and $2.95 for run-of-mine, and Hocking to $3.15. Gas coals are steady and quiet, Youghiogheny selling for $3.15 for ¾-in. Anthracite has sold better to dealers. The supply is good of all sizes.

Cleveland

Oct. 19—Steam trade continues good and domestic sales have been much improved by cold weather. Prices are unchanged, owing to the large supply.

No. 8 district steam coal sells at $1.90 @2.15 for lump; $1.80 for run-of-mine and $1.40 for slack. Middle district about 10c. less. Pittsburg coal is $2.10@2.25 for lump, $2@2.05 for run-of-mine and $1.40@1.50 for slack. Massillon coal for domestic use is $2.95 for lump.

Indianapolis

Oct. 18—Work in the Indiana coalfields is more nearly normal than for two years. The present demand for domestic coal.

coupled with the increasing orders from the northwestern markets, has increased the number of men employed to a point greater than ever before. The car shortage is still in evidence but the railroads made considerable improvement in furnishing cars during the past week. The demand for steam coal is increasing rapidly.

Pittsburg

Oct. 19—Coal prices have advanced pretty squarely 5c. a ton in the past week, demand being good and cars somewhat scarce, while it is usual for the market to trend upward at this time. Mine-run is now quotable at $1.10, with occasional cutting to $1.05, while slack is quotable at 60@65c. The Lake movement continues heavy, and nearly all the mines could use more cars than they are getting.

Connellsville Coke—A contract for 8500 tons of furnace coke per month over the first half of next year has just been made at $2.90 at ovens, this following another transaction, same price and delivery, for upward of 25,000 tons a month, noted in last report. Furnaces are rather reserved about contracting for next year, but operators are firm. There are really few sellers at $2.90 for the first half, although there are a number who would sell for the entire year at this figure. Arrangements have just been concluded for the commencement of shipments on the contract made last summer between the Thompson Connellsville Coke Company and the Jones & Laughlin Steel Company, calling for approximately 30,000 tons a month for three years, at $2 at ovens. Shipments are to begin Nov. 1 to Aliquippa, where the steel company is completing three blast furnaces. We note sales of 25 and 35 cars of furnace coke at $2.85, for delivery to Dec. 1. For December alone $3 would probably have to be paid.

We quote prompt furnace coke at $2.85 @3 and contracts for first half of next year or all year at $2.90@3; 72-hour foundry coke at $2.75@3 for prompt and $3 @3.40 for contract.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending Oct. 9 at 437,829 tons, a gain of 14,000 tons over the preceding week, and shipments at 4994 cars to Pittsburg, 7616 cars to points west of Pittsburg and 915 cars to points east of Connellsville, a total of 13,525 cars.

St. Louis

Oct. 18—The severe storm which swept over the country the first part of this week brought much cooler weather and consequently the retailers have been on the jump for the past few days. After the temporary lull of last week the market is stronger than ever and the demand for all domestic sizes is increasing. High-grade coal is harder to get than ever and nearly all producing companies have issued instructions to their salesmen to stop selling lump entirely. A few firms that have had nothing to sell but high-grade coal have called their men off the road. Egg is a little easier than lump though it is very scarce also; nut coal is also in strong demand and prices on it are advancing. The medium grades of coal are also very strong and high with no spot coal being offered. Lump is very scarce and producers in general are sold ahead several weeks on this size. Egg and nut coal, though, can be readily obtained at figures 25 or 20c. per ton under the lump.

Standard and the lower-grade coals have also showed considerable strength this week and the domestic sizes have advanced from 10 to 15c. per ton all down the line.

Some 2-in. steam nut on demurrage was sold as low as 30c. per ton f.o.b. mine yesterday and some 1½-in. screenings of the poorer varieties have been sold for freight this week. The general market, though, on Standard screenings is 5@10c. per ton f.o.b. mine and 50 cents per ton St. Louis for 1-in. to 2-in. steam nut.

Carterville 6-in. lump and egg are being quoted at $1.75 at mine or $2.42 St. Louis; 3-in. Carterville nut is $1.30 at mine of $1.97 St. Louis. Screenings are bringing about 35c. at mine or $1.02 St. Louis. Franklin County 6-in. lump or egg is $1.80@1.90 per ton at mine or $2.47@2.57 St. Louis. Standard 6-in. lump brings $1.10@1.20 at mine or $1.67@1.77 St. Louis and 2-in. Standard is sold at $1 at mine or $1.52 St. Louis. Staunton, Mt. Olive or Springfield district coal is bringing about $1.40 at mine or $1.72 St. Louis for 6-in. lump.

Hard coal is in strong demand and dealers' stocks throughout the State have run very low. A number of them are almost willing to pay a premium for spot coal. The supply of anthracite has not been up to demand for the past month.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, eight months ended Aug. 31, long tons:

	1908.	1909.	Changes.
Anthracite	1,825,902	1,904,330	I. 78,428
Bituminous	5,796,077	5,988,051	I. 191,974
Total coal	7,621,979	7,892,381	I. 270,402
Steamer coal	4,000,303	4,065,520	I. 65,217
Total	11,622,282	11,957,901	I. 335,619
Coke	404,013	616,370	I. 212,357

Canada took this year 6,089,129 tons of coal, or 77.2 per cent. of the total exports. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, eight months ended Aug. 31, long tons:

	1908.	1909.	Changes.
Anthracite	15,023	3,145	D. 11,878
Bituminous	1,015,301	747,534	D. 267,767
Total coal	1,030,324	750,679	D. 279,645
Coke	81,492	121,494	I. 40,002

Canada furnished this year 626,656 tons of coal and nearly all the coke; Australia, 102,223 tons of coal. Imports are chiefly on the Pacific Coast and in the Northwestern States—Montana, Idaho and Washington.

Iron Trade Review

New York, Oct. 20—The iron and steel markets continue active, although buying in some directions has been discouraged, owing to the crowded condition of the mills and the difficulty in getting material promptly.

Pig iron shows a heavy demand for bessemer and basic in the Central West and for foundry in eastern territory. Prices are strong, and furnaces are inclined to make advances, but are rather held in check by the prospect of imports of foreign iron.

In finished material some liberal orders for railroad equipment are coming in and there is a call for bridge work. Plates and bars are also in demand, and the sales to consumers by the jobbing interests are reported heavy.

Lake Iron Ore—Shipments of iron ore from the Lake Superior region, as reported by the Cleveland *Iron Trade Review*, were 7,050,985 tons. The shipments for the season to Oct. 1 were as follows, by ports, in long tons:

Port.	1908.	1909.	Changes.
Escanaba	2,006,192	4,002,796	I. 1,996,604
Marquette	871,107	1,979,517	I. 1,108,410
Ashland	1,521,146	2,422,004	I. 900,858
Superior	2,264,443	4,743,498	I. 2,479,055
Duluth	6,201,121	9,847,177	I. 3,646,056
Two Harbors	3,766,951	6,644,541	I. 2,877,590
Total	16,630,960	29,639,533	I. 13,008,573

The total shipments were only 919,673 tons below the record movement of two years ago.

Baltimore

Oct. 19—Exports for the week included 689,200 lb. steel billets to Liverpool. Imports included 14,500 tons iron ore from Cuba; 7050 tons manganese ore from India; 5590 tons cupreous pyrites from Spain; 405 tons ferromanganese from Liverpool.

Birmingham

Oct. 19—Pig-iron prices in the Southern territory show additional strength. A peculiar situation was noted in the Birmingham district during the past week. A meeting of the iron manufacturers and coal operators was held and expressions given deprecating the runaway iron market, the sudden advancing of the quotations and the wide publicity being given to the advancing market. At the same time there were statements made that

prices for the first quarter of next year had gone to $15.50. The inquiries are still active, though selling has been halted a little by the advancing prices. However, $15 per ton, No. 2 foundry, appears to be a strong level and while furnace companies are willing to sell large quantities of iron at that price for delivery during the first half of the coming year there is no inclination to sell at a lower price.

The industries employing iron and steel in their operation in the Southern territory are all doing well, the consumption of iron showing improvement right along.

Chicago

Oct. 19—The iron market is quieter, but sales of foundry iron seem to be steady, while inquiries continue to come in. Southern No. 2 is $15 Birmingham, or $19.50 Chicago, but makers are talking of $15.50, and are not willing to take anything beyond first quarter. Northern is firm and $19.50 is asked for first-quarter deliveries. Most sales are for first quarter, melters being generally supplied up to the end of the year, though a few small orders are still coming here and there.

Iron and steel products are in demand, especially railroad supplies. Coke is in good supply at $4.85 for Connellsville.

Philadelphia

Oct. 20—Eastern pig-iron makers report a continuance of demand for all kinds of pig iron from the general run of the trade. The surpassing activity in western Pennsylvania is reflected here in the unwillingness of most producers to make remote-delivery contracts. Some large consumers in the New England and Middle States are pressing their side of the case urgently and would like to arrange definitely for winter and early spring deliveries. Makers are unyielding on this point.

Malleable iron is being purchased frequently. The hardware industry is in vigorous condition. Prices are quoted today at $19 for No. 2X for Northern and Southern gray forge $17.75.

Scrap—The supply of heavy cast scrap is out. Supplies of machinery and yard scrap are low. Yardmen have orders for December delivery. Railroad scrap is quoted 50c. higher.

Pittsburg

Oct. 19—The iron and steel market shows a quieter condition all around. Except in a few products, notably sheets and tinplates, the mills are averse at this time to making heavy engagements for next year, but as a matter of fact they are already pretty well sold for first quarter on bars, plates and shapes. It is in sales to jobbers in particular that the producers are conservative, apparently feeling that there is danger of excess commitments. While general buying is lighter, the trend of railroad buying is distinctly on the increase.

While the market is quiet the mills are extremely busy. Specifications have been pouring in at a rapid rate. The mills are all working for maximum outputs.

Sheets and tinplates are being sold for delivery to April 1, but in rather a conservative way. Tinplates are $3.50 for 100-lb. cokes, sheets 2.30c. for No. 28 gage black and 3.35c. for galvanized; bars are at a minimum of 1.40c. and plates and shapes at a minimum of 1.50c., for the most desirable specifications and deliveries, but the average market prices are quotable at $1 a ton above these minima.

Pig Iron—Sales of bessemer pig iron continue large. The Republic Iron and Steel Company has taken 20,000 tons for first quarter, from the Bessemer Pig Iron Association. Two local interests have taken 5000 and 7000 tons respectively for this quarter; a merchant-furnace interest has picked up two lots aggregating about 15,000 tons for this quarter and a local steel interest has picked up several small lots of prompt, aggregating between 5000 and 10,000 tons, all these transactions being on the basis of $19, Valley, 50c. above the sales noted in last report, and the market seems to be making rapidly for the $20 level. There is heavy inquiry for basic, but business is slow in closing. Basic is quotable at $17.25, Valley, for prompt, and $17.50 for delivery through the year, with clear prospects of an advance. Foundry iron has been dull, but this does not retard furnaces from marking up prices. It is difficult to do $17, Valley, on No. 2 foundry iron, even for early shipment, while odd lots have sold up to $17.50 and some furnaces are asking $18. Consumers appear to be well covered. Consumption by foundries has hung behind consumption for steel-making purposes.

Steel—Crude steel is scarce and it is difficult to quote prices. It is a question of getting deliveries rather than of naming prices. Nominally billets can be quoted at about $26, maker's mill, Pittsburg district, with sheet bars at $27@28 at mill.

Ferromanganese—The market is stronger, with prompt quoted at $43, November and December $43.50@44 and first quarter at $44.50@45, f.o.b. Baltimore, freight to Pittsburg being $1.95 per ton.

St. Louis

Oct. 18—The pig-iron market is very brisk this week, though the activity is confined almost entirely to selling for the first half of next year. There is practically nothing left for delivery this year and very little for the first quarter. The market is strong at $15.50 per ton, Birmingham or $19.25 St. Louis. Floods of inquiries were received this week, among which were some large ones. The Scullin-Gallagher Iron and Steel Company, of this city, issued a circular calling for bids on 10,000 tons of pig iron.

Metal Markets

New York, Oct. 20—The metal markets have been rather irregular. Advancing prices in some metals are balanced by weakness in others.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1909..	$ 9,230,000	$ 5,349,000	Exp. $ 3,881,000
" 1908..	6,597,101	4,257,255	" 2,339,846
Year 1909..	89,726,119	28,754,477	" 60,971,642
" 1908..	64,960,348	33,614,330	" 31,346,018
Silver:			
Aug. 1909..	4,910,000	3,191,000	Exp. 1,719,000
" 1908..	4,130,853	3,194,426	" 936,427
Year 1909..	39,319,032	29,989,145	" 9,329,887
" 1908..	34,576,144	27,375,355	" 7,200,789

Exports from the port of New York, week ended Oct. 16: Gold, $110,000, chiefly to Brazil; silver, $560,800, to London and Paris. Imports: Gold, $193,515, from Haiti, South America, Japan and Australia; silver, $122,747, chiefly from Mexico.

Gold output in the Transvaal in September is reported by cable at 606,385 oz. fine, being 5152 oz. less than in August, and 18,751 oz. more than in September, 1908. For the nine months ended Sept. 30, the total was 5,159,859 oz. in 1908, and 5,475,374 oz.—or $113,175,981—in 1909; an increase of 315,515 oz., or $6,521,695.

Gold—There was a strong demand for gold on the open market in London and quotations were 77s. 11¾d. per oz. for bars and 76s. 4¾d. per oz. for American coin. The Bank of England took most of the supplies. No exports from New York are noted.

Platinum—The advance continues, and dealers are this week asking $27.75 per oz. for refined platinum and $31.50 per oz. for hard metal. A further advance is anticipated. A consumer contributes the following: The market for platinum is advancing rapidly. We have been quoted within the last 10 days $2.50 higher than we paid for ingot in August. From all sources we receive the same story, that the platinum market is likely to reach high figures within the next few months.

The silver market dropped this week to 23 7/16d. in London, and was quoted weak at this price on Oct. 15, but since then has stiffened. On buying by Chinese banks the price improved to 23 9/16d. and closes steady at 23½d. in London.

Exports of silver from London to the East, Jan. 1 to Oct. 7, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 7,329,163	£4,675,406	D. £2,653,757
China.....	516,400	1,555,200	I. 1,038,800
Straits.....	112,385	82,800	D. 29,585
Total.....	£ 7,957,948	£6,313,406	D. £1,644,54

Receipts for the week, £4000 from the West Indies, and £173,000 from New York; total, £177,000. Exports, £46,000 to India.

SILVER AND STERLING EXCHANGE

Oct.	14	15	16	18	19	20
New York....	51	50¾	50¾	50⅞	51	51
London.....	23 9/16	23 7/16	23 7/16	23⅛	23 9/16	23⅛
Sterling Ex..	4.8605	4.8600	4.8610	4.8640	4.8650	4.8650

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

Oct.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
14	12⅞ @13⅛	12⅝ @12¾	57⅛	30⅜	4.32½ @4.35	4.20 @4.22½	5.95 @6.00
15	12⅞ @13⅛	12⅝ @12¾	57⅛	30½	4.32½ @4.35	4.20 @4.22½	6.00 @6.05
16	12⅞ @13⅛	12⅝ @12¾	....	30½	4.32½ @4.35	4.20 @4.22½	6.02½ @6.07½
18	12⅞ @13⅛	12⅝ @12¾	57¾	30⅝	4.32½ @4.35	4.20 @4.22½	6.10 @6.15
19	12⅞ @13⅛	12⅝ @12¾	57¾	30⅝	4.32½ @4.35	4.20 @4.22½	6.15 @6.20
20	12⅞ @13⅛	12⅝ @12¾	57½	30⅝	4.32½ @4.35	4.20 @4.22½	6.15 @6.20

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X			
XI			
XII			

	VISIBLE SUPPLIES. United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,037,137	210,224,000	361,261,137
XI			
XII			

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Copper—The market is quiet. Domestic manufacturers are busy and consumption is good, but in view of the statistical position they continue to buy from hand to mouth, and operate with smaller stocks of copper than usual. Producers, on the other hand, are not pressing sales. The bulk of the business since Oct. 13 has been for delivery in Europe, on which the sellers have realized somewhat less than upon sales for delivery in this country. For domestic business electrolytic copper has been freely offered at 12⅞c., delivered, 30 days, or a little less than 12¾c., cash, New York, and sales have been made at that figure. A moderate amonut of Lake copper has been sold at around 13c. The market closes unchanged at 12⅞@13⅛c. for Lake copper, and 12⅝@12¾c. for electrolytic copper in cakes, wirebars, or ingots. Casting copper is quoted nominally at 12½@12¾ cents.

Advices from consumers of copper in this country indicate that the business of the wire drawers is still lagging. On the other hand, business in the brass and sheet trade is booming. The mills at Waterbury are working overtime, and are said to be having some difficulty in keeping up to the market. They are said to be well stocked with the raw material.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14½c. base, carload lots at mill. Business continues on a good scale.

The standard market in London has fluctuated within narrow limits. On Monday, it had advanced to £57 18s. 9d. for spot, but owing to the higher rates for money some realizations took place, and in consequence prices declined and at the close are £57 10s. for spot, and £58 10s. for three months.

Refined and manufactured sorts we quote: English tough, £61 10s.; best selected, £60 10s.@£61 10s.; strong sheets, £72 10s.@£73 10s. per ton.

Exports of copper for the week from New York and Philadelphia were 4413 long tons. Our special correspondent gives the exports from Baltimore at 789 tons of copper.

Tin—The London market has developed rather a firm tone, and speculation has become more extended. While a bearish element in the market is making use of the large shipments from the Straits to depress prices there, they have not succeeded to a very large extent; the bulls, on the other hand, point to the large and constantly increasing consumption in this country in defense of their position. The London market closes at £138 2s. 6d. for spot, and £139 12s. 6d. for three months. A fair business has been done in this market, quotations at the close being about 30⅜@30⅝ cents.

The Dutch Trading Company, with the approval of the government, gives notice that the quantity of Banka tin to be sold next year will be about 225,000 pikuls.

Messrs. Ricard & Freiwald estimate the production of tin entering into the usual estimate of stocks as follows, for the 12 months ended Oct. 31, 1909: Straits, 58,971; Banka and Billiton, 14,093; Australia, 5204; total, 78,268 long tons. Deliveries for same period: London, 15,789; other Europe, 21,650; United States, 38,500; total, 75,939 tons, or 2329 tons less than supplies. This does not include Cornwall and Bolivian tin.

Lead—The market is quiet and unchanged at 4.32½@4.35c. New York, and 4.20@4.22½c. St. Louis.

The London market has been steady at £13 5s. for Spanish, and £13 7s. 6d. for English lead.

Spelter—The demand for this metal, both for galvanizing and for brass-making, has continued to increase, and during the week Oct. 14-20, there has been a large business from day to day, the aggregate amounting to many thousands of tons. With this demand and the strong position of the smelters, who are well sold ahead, the market gradually advanced and closes strong at 6.15@6.20c., St. Louis, and 6.30@6.35c., New York. Specials command a premium of 0.15@0.25 cent.

New York quotations for spelter on Oct. 14 were 6.10@6.15c.; Oct. 15, 6.15@6.20c.; Oct. 16, 6.17½@6.22½c.; Oct. 17, 6.25@6.30c.; Oct. 19 and 20, 6.30@6.35 cents.

The London market is unchanged at £23 5s. for good ordinaries and £23 10s. for specials.

Base price of sheet zinc has been advanced to 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Silesian Zinc Market—Paul Speier writes from Breslau, Germany, under date of Sept. 30, that the market has been strong specially on account of the demand from the British galvanizers. Exports have been heavy. The price is 47 marks per 100 kg. for ordinary brands, f.o.b. works in Silesia—equivalent to 4.6c. per lb. Special brands bring 1 mark more. Zinc sheets are also active, and prices are 56 @61 marks per 100 kg. at works—equal to 6.3c. per lb. Zinc dust is quoted at 42 marks per 100 kg., boxed and delivered at Stettin, which is equivalent to 4.5c. per lb. Sales of dust have been good.

Other Metals

Antimony—Business is improving and there are more inquiries, so that the market shows a better tone. Prices have been better adjusted, and Cookson's is quoted at 8⅜@8½c. per lb.; Hallett's, 8¼@8⅜c.; U. S., 7⅞@8c.; outside brands, 7⅝@7¾c. Stocks of outside brands have been generally cleared out.

Aluminum—There is no change in the market. No. 1 ingots are 20@23c. per lb. in large lots, the American maker holding to the higher figure.

Quicksilver—Demand continues strong and prices are again higher. In New York the quotation is $47@48 per flask of 75 lb., for large lots, while jobbers quote 66@67c. per lb. for small quantities. San Francisco quotations are $45@46 for domestic orders; $2 less for export. The London price is £8 12s. 6d. per flask, with jobbers quoting the same price.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Imports and Exports of Metals

Exports and imports of metals in the United States, eight months ended Aug. 31, are reported as follows, in the measures usual in the trade.

Metals:	Exports.	Imports.	Excess.
Copper, long tons	211,047	91,511	Exp. 119,536
Copper, 1908....	215,361	51,800	Exp. 163,561
Tin, long tons....	294	28,454	Imp. 28,160
Tin, 1908.....	156	23,441	Imp. 23,285
Lead, short tons.	64,943	76,189	Imp. 11,246
Lead, 1908.....	47,606	72,061	Imp. 24,455
Spelter, sh. tons.	2,259	5,177	Imp. 2,918
Spelter, 1908....	2,111	504	Exp. 1,607
Nickel, lb.	7,421,687	13,258,622	Imp. 5,836,935
Nickel, 1908....	7,406,645	11,849,238	Imp. 4,442,593
Antimony, lb..	6,648	6,272,943	Imp. 6,266,295
Antimony, 1908.		5,291,489	Imp. 5,291,489
Platinum, oz.....	... .	72,538	Imp. 72,538
Platinum, 1908.		19,822	Imp. 19,822
Quicksilver, lb	181,865	.....	Exp. 181,865
Quicksilver, '08	109,936	.....	Exp. 109,936
Aluminum, value	$288,290	... .	Exp. $288,290
Aluminum, 1908	267,524	.....	Exp. 267,524
Ores, etc.:			
Zinc oxide, lb.	18,682,683	.....	Exp. 18,682,683
Zinc oxide, '08.	16,838,200	.....	Exp. 16,838,200
Zinc dross, lb....	12,227,995	.....	Exp. 12,227,995
Zinc dross, '08..	12,859,411	.....	Exp. 12,859,411
Zinc ores, lg. tons	9,092	80,105	Imp. 71,013
Zinc ores, 1908.	18,887	30,305	Imp. 11,418
Antim'y ores, lb.	504	3,386,208	Imp. 3,385,704
Ant. ores, 1908.	.....	974,732	Imp. 974,732
Chrome ore, tons	24,891	.....	Imp. 24,891
Chrome ore, '08	.....	.....	.....

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Chrome ore was not reported separately last year.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 16—The highest price paid for zinc ore was $52.80 for one bin of ore that sold on a base price of $49.50 per ton of 60 per cent. zinc, and assayed 63.30 per cent. metallic zinc. All other ore sold from $49 down to $47 per ton of 60 per cent. zinc. Silicate ore was in unusually strong demand, the buyers of this ore scrapping for it until it was advanced out of proportion to the general market. One bin of 38 per cent. ore sold on a straight bid of $29, and base offerings were $27@28 per ton of 40 per cent. zinc. The average price, all grades, was $45.26. Lead ore sold as high as $55 on a straight bid and $54.50 per ton of 80 per cent. lead was paid. The average price, all grades, was $54.60 per ton.

Upward of 9000 tons of zinc ore has accumulated in the bins, nearly 4000 tons of which is being held for a base price of $50 or better. Half of the remaining stock is sold, but delivery is delayed from lack of cars.

SHIPMENTS, WEEK ENDED OCT. 16.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,720,070	611,820	$104,246
Joplin.....	1,983,610	154,840	52,321
Aurora.....	806,330	14,640	15,200
Prosperity.....	241,680	273,420	13,198
Duenweg.....	406,960	62,240	11,274
Galena.....	417,170	67,030	11,240
Alba-Neck.....	311,270	58,070	9,348
Spurgeon.....	297,300	89,960	8,377
Carthage.....	328,220	.....	8,205
Granby.....	502,300	9,000	7,185
Carl Junction.....	200,700	.....	5,118
Badger.....	202,470	.....	4,859
Oronogo.....	.....	170,920	4,555
Cave Springs.....	126,640	16,590	3,409
Sarcoxie.....	143,240	.....	2,608
Quapaw.....	54,550	2,840	1,249
Totals	9,742,510	1,531,370	$262,392
42 weeks.....	471,675,810	71,120,990	$11,234,784

Zinc value, the week, $220,578; 42 weeks, $9,295,200
Lead value, the week, 41,814; 42 weeks, 1,939,584

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January.....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February..	36.63	36.94	34.92	34.37	49.72	50.50
March...	36.19	37.40	34.19	34.71	49.90	50.82
April.....	35.40	38.63	34.08	37.01	52.47	55.63
May.....	34.19	40.06	33.39	37.42	56.05	56.59
June.....	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September ..	37.63	47.70	34.44	44.87	54.59	56.11
October.....	35.95	.....	33.28	.....	52.63	.....
November...	39.13	.....	35.02	.....	54.53	.....
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Oct. 16—The base price paid this week for zinc ore was $48@49 per ton. The base price paid for lead ore was $55@56 per ton.

SHIPMENTS, WEEK ENDED OCT. 16.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton.....	473,700	62,800	65,700
Cuba City.....	413,130	.....	118,785
Galena.....	320,000	.....	.....
Hazel Green.....	304,800	.....	.....
Platteville.....	214,700	.....	309,500
Highland.....	193,100	.....	.....
Days Siding.....	160,000	.....	. ....
Shullsburg.....	150,000	.....	.....
Linden	126,000	.....	.....
Livingston.....	80,000	.....	.....
Total.....	2,435,430	62,800	493,985
Year to Oct. 16.....	108,760,085	6,886,375	10,681,830

In addition to the above there was shipped to the American Zinc Ore Separating Company, 745,900 lb. and to the Joplin Separator Works, 421,010 lb. zinc concentrates.

Petroleum

Exports of mineral oils from the United States, nine months ended Sept. 30, in gallons:

	1908.	1909.
Crude petroleum.....	70,836,199	107,551,376
Naphthas.....	26,529,853	47,396,995
Illuminating oil.....	859,687,807	781,679,734
Lubricating and paraffin..	105,316,678	109,258,012
Residuum.....	55,559,723	73,512,494
Total.....	1,117,930,260	1,119,398,611

The total increase in exports this year was 1,468,351 gal., or 0.1 per cent.

Chemicals

Oct. 20—Conditions are unchanged from last week. Contract deliveries are fair, but spot business slow.

Copper Sulphate—Business is quiet and prices are again a shade lower, at $3.90 per 100 lb. for carload lots, and $4.20 per 100 lb. for smaller parcels.

Arsenic—Buyers are holding back for lower prices, while sellers are inclined to hold for an improvement. White arsenic is quoted at 2.70@2.75c. for spot, and 2.87½c. for 1910 delivery.

Nitrate of Soda—The market is quiet and quotations steady at 2.10c. per lb. for both spot and futures.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, eight months ended Aug. 31:

	Imports.	Exports.	Excess.
Copper sulph. lb.		2,122,250	E. 2,122,250
Bleach, lb.....	56,833,701	13,964	I. 56,819,737
Potash salts, lb..	246,349,166	1,867,664	I. 244,481,502
Soda salts, lb....	10 241,570	445,205	I. 9,796,365
Acetate lime, lb.		50,358,623	E. 50,358,623
Nit. of soda, tons	253,542	6,240	I. 247,302
Phosphates, tons	10,277	737,065	E. 726,788
Sulphur, tons....	20,086	13,686	I. 6,400
Pyrites, tons.....	449,387	.....	I. 449,387
Magnesite, lb....	27,536,255	206,535	I. 27,329,720

Estimating sulphur contents of pyrites, total imports of sulphur this year were 199,841 tons. Exports include reëxports of foreign material. Magnesite figures are for July and August only.

Mining Stocks

New York, Oct. 20—There has been a good deal of activity on the Stock Exchange, but rather of a professional kind. Quotations have hardly held their own, but have varied from day to day in both directions. There was quite a sharp rise yesterday, but it was followed by an equally sharp decline, and the close was rather heavy. Higher rates for money had rather a depressing effect and the Bank of England increase to a 4-per cent. rate was an unfavorable factor.

There was one sale of Homestake of South Dakota, 100 shares changing hands at $91.25 per share.

On the Curb the principal activity was in coppers, Cumberland-Ely and Giroux

being the leaders. Quotations varied, but only to a moderate extent. Cobalt stocks were rather heavy and the Nevada gold stocks were not active.

Boston, Oct. 19—The talk of a copper combination has given stocks quite a smart rise. There is not so much activity nor is public interest yet aroused, but sentiment is considerably improved. There has been little in the way of news. Isle Royale had a smart rise which amounted to $4, putting the price up to $27, but it reacted to $24.50. Atlantic moved up $2 in sympathy, touching $12.25, while Michigan, on the other hand, broke from $9 to $5.75 on the practical closing down of the mine. Much surprise and disappointment are felt in this action as a $2 assessment was paid only last September. The explanation is that the money was to pay off floating debt. The company's mill is about 90 per cent. completed.

North Butte had a $2 advance to $60.50, but subsequently reacted to $57.50, under manipulative orders. Butte Coalition is selling on a higher level, being up $2.25 to $27.12½. Buying of the latter is said to be for good account.

Other strong stocks have been American Zinc and U. S. Coal and Oil. The former is at the highest this year, having risen $2.37½ to $36.25.

Curb business shows quite an improvement and at advancing prices. Ely stocks appear to be the favorites. Boston & Ely has advanced $1.25 to $2.87½. Ely Consolidated is up from 34 to 64c. per share.

STOCK QUOTATIONS

NEW YORK	Oct. 20
Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	83⅜
Anaconda	47⅝
Balaklala	‡2⅛
British Col. Cop.	6¼
Buffalo Mines	3⅜
Butte Coalition	26½
Colonial Silver	‡⅝
Cum. Ely Mining	7⅛
Davis-Daly	5⅞
Dominion Cop.	7
Douglas Copper	⅛
El Rayo	2½
Florence	2⅞
Foster Cobalt	‡.32
Furnace Creek	‡ 05
Giroux	8⅛
Gold Hill	⅛
Goldfield Con.	6⅞
Granby	‡95
Greene Gold	‡⅛
Greene G. & S.	‡9
Guanajuato	2½
Guggen. Exp.	213
Hanapah	‡15
Kerr Lake	8⅛
McKinley-Dar.	.88
Miami Copper	15⅜
Micmac	⅛
Mines Co. of Am.	⅜
Montezu. of C. R.	20
Mont. Sho. C.	1⅝
Nev. Utah M. & S.	1⅜
Newhouse M. & S.	3
Nipissing Mines	11¾
Old Hundred	½
Silver Queen	.30
Stewart	⅞
Tennessee Cop'r.	35⅝
Tri-Bullion	¾
United Copper	9½
Utah Apex	‡4⅛
Utah Copper	48⅛
Yukon Gold	5 1/16

‡Last quotation.

BOSTON	Oct. 20
Name of Comp.	Clg.
Adventure	5
Allouez	59
Am. Zinc	35¾
Arcadian	4¼
Arizona Com.	44⅛
Atlantic	10½
Boston Con.	14¼
Calumet & Ariz.	100
Calumet & Hecla	662
Centennial	38¼
Copper Range	80¼
Daly-West	7½
East Butte	11
Franklin	16½
Greene—Can.	11⅝
Hancock	11
Isle Royal	25
Keweenaw	3¼
La Salle	14½
Mass	6¼
Michigan	6¼
Mohawk	59
Nevada	25
North Butte	58
Ojibway	8
Old Colony	.50
Old Dominion	.52½
Osceola	156
Parrot	30⅞
Quincy	89
Rhode Island	4¾
Shannon	15¾
Superior	79
Superior & Bost.	14½
Superior & Pitts.	15½
Tamarack	70
Trinity	10¾
U. S. Smg. & Ref.	56½
U.S.Sm. & Re., pd.	53¼
Utah Con.	43
Victoria	3¾
Winona	6½
Wolverine	148
Wyandotte	2¾

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	46¼
Am. Smelt. & Ref.	97⅞
Am.Sm. & Ref., pf.	112
Colo. Fuel & Iron.	44¾
Federal M. & S., pf.	‡80
National Lead	88¾
National Lead, pf.	110½
Pittsburg Coal	20½
Republic I. & S.	46½
Republic I. & S., pf.	105¼
Sloss-Sheffield	92¾
Standard Oil	685
U. S. Steel	90⅛
U. S. Steel, pf.	127⅞
Va. Car. Chem.	‡45¼

BOSTON CURB	Low.
Ahmeek	‡210
Chemung	‡16¾
Chino	77/8
Gila	7¾
Indiana	6
Mason Valley	2
Ray Central	2¼
Ray Con.	18¼
San Antonio	8⅛
Yuma	1¾

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS	Oct. 16	
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.10	.07
Center Cr'k	1.80	1.60
Cent.C.&C.	84.00	83.00
C.C. & C. pf.	83.00	82.00
Cent. Oil	110.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	17.00
Doe Run	115.00	105.00
Gra. Bimet.	.27	.23
St. Joe	12.50	11.00

LONDON	Oct. 20
Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 7 9
Esperanza	2 17 6
Tomboy	0 19 6
El Oro	1 5 6
Oroville	0 11 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 20.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.15
Best & Belcher	.85
Caledonia	.64
Chollar	.26
Comstock	.33
Con. Cal. & Va.	1 80
Crown Point	1 30
Exchequer	‡.43
Gould & Curry	.30
Hale & Norcross.	.65
Mexican	1.90
Ophir	2.20
Overman	.64
Potosi	.63
Savage	.58
Sierra Nevada	.73
Union	.95
Utah	.14
Yellow Jacket	1.50
TONOPAH STOCKS	
Belmont	.75
Extension	.50
Golden Anchor	...
Jim Butler	.11
MacNamara	.26
Midway	.16
Montana	.85
North Star	.02
Tono'h Mine of N.	6.62½
West End Con.	.25
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.10
Blue Bell	.02
Booth	.10
C.O.D. Con.	.06
Columbia Mt.	.06
Comb. Frac.	.61
Cracker Jack	.01
Dia'dfield B. B. C.	.01
Florence	2.75
Goldfield Belmont	.04
Goldfield Daisy	.08½
Great Bend	.03
Jumbo Extension	.13
Kendall	.02
Lone Star	.02
May Queen	.04
Oro	.03
Red Hill	.03
Sandstorm	.05

Name of Comp.	Bid.
Silver Pick	.11
St. Ives	.05
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King.	‡.01
Mont. Shoshone C.	1.37½
Tramp Cons	.04½
MISCELLANEOUS	
Cumberland Ely.	7.50
Giroux	8.75
Greenwa'r Copper	‡.03
Nevada Con.	24.62½
Nevada Hills	.60
Navada Smelting.	.75
Nevada Wonder	.55
Nevada-Utah	1.56¼
Penn-Wyoming	...
Pittsburgh S. Pk.	.60
Ray Central	2.18½
Ray Con.	18.00
Round Mt. Sphinx	.06

COLO. SPRINGS	Oct. 15
Name of Comp.	Clg.
Acacia	.07
C. C. Con.	.03
Doctor	.08¼
Elkton	.72
El Paso	.61½
Findlay	.10
Gold Dollar	.11
Gold Sovereign	.04½
Isabella	.17⅞
Jack Pot	‡.08½
Jennie Sample	.07¾
Jerry Johnson	‡.06¾
Lexington	‡.01¾
Mary McKinney	‡ 46¼
Old Gold	.04⅜
Pharmacist	.03⅜
Portland	.02
U. G. M.	.07½
Vindicator	.72
Work	‡.07

Assessments

Company.	Delinq.	Sale.	Amt.
Alameda M. & M., Ida.	Oct. 7	Nov. 4	$0.005
Black Traveler Copper, Ida.	Sept. 27	Oct. 27	0.005
Caledonia, Nev.	Oct. 21	Nov. 11	0.10
Copper Mt. M. & D., Ida.	Aug. 2	Nov. 2	0.003
Gold Mt., Utah	Sept. 15	Nov. 15	0.0025
Hypothek, Ida.	Sept. 30	Dec. 1	0.005
Idaho North Star, Ida.	Oct. 23	Nov. 15	0.01
Julia Con., Nev.	Oct. 14	Nov. 8	0.03
Missoula Copper, Ida.	Oct. 4	Dec. 6	0.01
Pawhattan, Ida.	Oct. 7	Nov. 8	0.001
San Antonia Copper, Mex.	Dec. 1		1 00
Sheba G. & S. Mining, Utah	Sept. 28	Oct. 30	0.05
Sierra Nevada, Nev.	Oct. 12	Nov. 3	0.10
Silver King Con., Utah.	Oct. 4	Oct. 23	0 10
Silver Queen, Utah.	Oct. 7	Nov. 15	0 0025
Silver Spray, Ida.	Oct. 14	Nov. 15	0.0005
Square Deal M. & M., Ida.	Oct. 14	Nov. 4	0.001
United Silver-Lead, Ida.	Sept. 21	Nov. 20	0.001
St. Louis, Nev.	Oct. 22	Nov. 12	0.01
Utah, Nev.	Oct. 26	Nov. 16	0.05
Wabash, Utah.	Oct. 11	Oct. 30	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.440	23.877	23.743
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Total	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56½	12.928	12.93¾	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	....
May	30.015	29.225	November	30.348	....
June	28.024	29 322	December	29.154	...
			Av. year.	29.465	...

Prices are in cents per pound.

LEAD

Month.	New York.	St. Louis	London.	
	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4 214	12.938	13.225
June	4.466	4.350	4 291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	.....	.....	13.375	.....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5 729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.